THE STORY OF THE FOREST

J. GORDON DORRANCE

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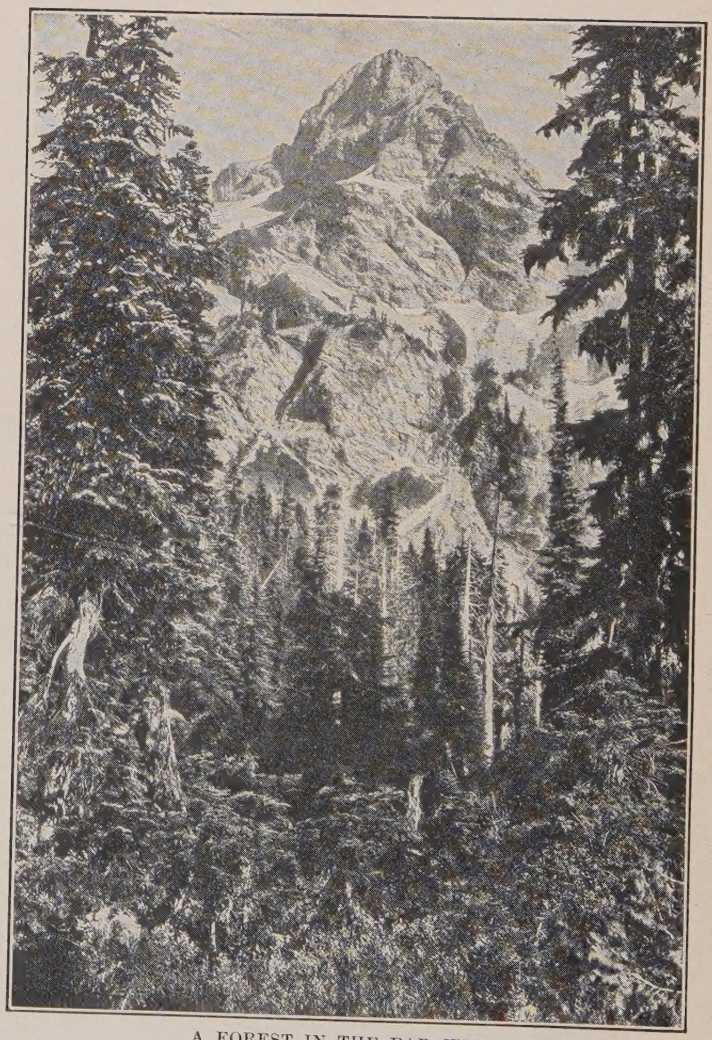
THE STORY OF THE FOREST



A FOREST IN THE FAR WEST
Cascade Range, Washington

THE
STORY OF THE FOREST

BY

JOHN GORDON DORRANCE, F. E.

State Board of Forestry
Maryland

AMERICAN BOOK COMPANY

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E. P. I.

TO MY TWO MOTHERS

NATURE, WHO INSPIRED ITS UNDERTAKING, AND

E. T. D., WHO INSPIRED ITS COMPLETION,

THIS BOOK IS AFFECTIONATELY

DEDICATED

Preface

From earliest childhood the forest is a place of interest. It is first known as the mysterious haunt of some good fairy or wicked elf. Then it becomes a playground for youth: the scene of many vigorous rompings by the boys and of not a few of the quieter pastimes of the girls. Later it furnishes the shaded resort for picnics and excursions. It is a place preferred above all others by the devotees of gun and rod. To students of Nature and others of a thoughtful turn of mind, it is the sequestered retreat wherein is the atmosphere of inspiration to lofty purposes and high ideals.

The charm of the forest is not confined to any particular rank or body of people. The magnificence and splendor of its natural growth, the peace and quiet of its dusky recesses, the sights and sounds of its wild life — all have their irresistible appeal, not only to the keen student and ardent frequenter, but to the casual observer and chance visitor as well.

Even the most thickly populated and built-

up centers of civilization have a forest or wood, somewhere near at hand, which is ever offering opportunities for study and observation. Its lesson is perennial; its book lies always open.

With the design of telling the younger generation what the woodlands of this country are, and what they mean, this book has been prepared, chiefly for use in the schools. Much of what it contains is new and out of the beaten track of textbooks, but it is nevertheless important, especially at this time, when more attention is being concentrated upon subjects of practical importance. These earlier lessons being learned, pupils will be in a position to take an advanced step in nature study and in that other subject, very closely allied to it, American forestry.

It is desired here to express appreciation to Mr. J. M. Daiger for criticisms of the book, and to Mr. D. D. Bronson, Dr. F. W. Besley, Mr. K. E. Pfeiffer and the United States Forest Service for courtesies and assistance which were of value in securing many of the illustrations.

John Gordon Dorrance.

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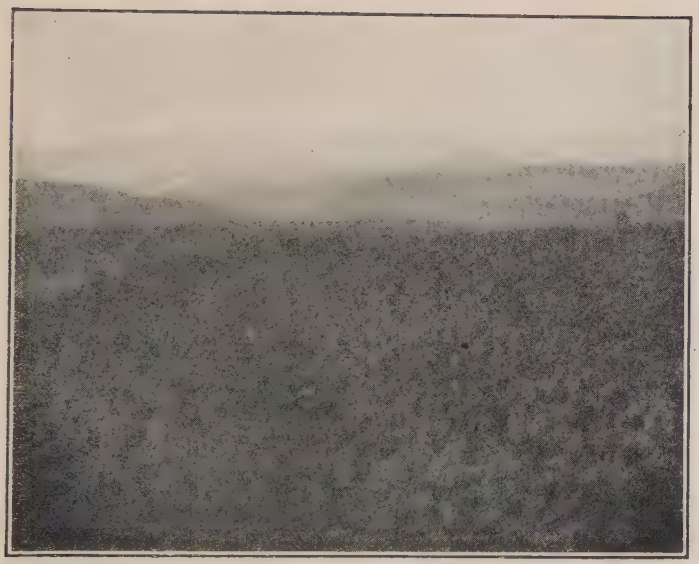
THE FORESTS OF AMERICA

AN EARLY SETTLEMENT IN THE FOREST

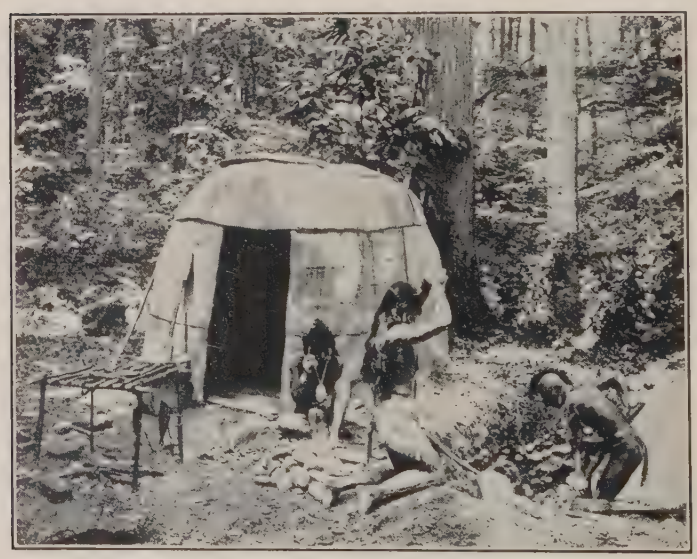


The Forests in Early Days

GREAT forests once covered most of North America. In Canada they stretched unbroken from coast to coast. In our own country they reached from the Atlantic on the East to the Middle West. The Middle West itself was, in great part, a vast plain where forests then, as now, were almost unknown. The region of the Rocky Mountains was forest-clad, and the Pacific Coast was thickly wooded. This primeval woodland of ours was the finest in the whole

world, covering nearly nine hundred million acres of land.

The first white settlers in America found forests everywhere. From these forests they obtained



EARLIEST DWELLERS IN THE GREAT FOREST

the materials for their log houses. From them they cut the firewood which warmed their rude homes through the long, cold winters in the new country. And much else that they needed was supplied to them by the forests.

People now look upon a forest as a friend, but to the first settlers it seemed more like a foe. It must be subdued before they could fully enjoy their new homes. So they made clearings around their cabins. And as soon as they could do so, they turned the woodlands into fields, and the fields, increasing in number, were soon expanded into farms. In the clearings, between the dead and dying trees, they planted Indian corn, pumpkins, and beans.

At that time there were many wild animals in the woods — deer and bears, foxes, and wolves. Squirrels and rabbits were plentiful, too, as were also wild turkeys, partridges, and quail; and there were wild pigeons so numerous that when a great flock took flight it seemed to darken the sky. Many of these animals and game birds were easily killed and helped to supply the settlers with good food.

The Log Cabin

Of course, in those very early times there were no sawmills nor brickyards in our country. The first white men had little to work with but their own strong arms and stout hearts. But these, with a good broadax, were enough; and soon the first log houses sprang up in the woods. The first American home was a log cabin. The first habitations of the pioneers in the West, as in the East, were log cabins. These long ago gave place to more commodious and pretentious dwellings; but in the woods and mountains of the South and of the far West, log cabins may still be seen.

When the settler had chosen the spot for his new home, he went out in the woods with his ax. Selecting large, straight trees, he soon brought them to the ground, trimmed off their limbs, and cut the tree trunks into logs of convenient length. With his oxen or horses, he dragged them to the place where they were needed. There the ends were hewed flat and notched, and all was made ready for the "raising."

A house raising was one of the noteworthy events in the new country. There were few settlers and, therefore, neighbors lived far apart in those days. But, when a new home was to go up in the forest, willing hands were never lacking to help put the walls in place and raise the rafters. At the raising, two logs, with one side of each notched, and that side upward, were laid parallel on the ground. They were as far apart as the settler wished the width of his house. Other logs were placed across the ends of these, so that their notched ends fitted neatly together. This was done many times, until the house was as high as its owner desired. Gables were added at the ends. They, too, were only rough logs, each cut shorter than the one under it. The gable

logs were made slanting at the ends, and fastened together with wooden pins. Nails were scarce and costly, and therefore wooden pins were driven into auger holes to answer the same purpose. Poles for rafters were finally put in place,

A HOUSE RAISING

running the entire distance from gable to gable, and the raising was complete. The settler was left to add the finishing touches to his new home.

Long, hand-split shingles called "shakes" or square pieces of birch or chestnut bark made the roof. These were held in place by long and slender roof poles that were fastened to the rafters by means of wooden pins.

There were but few windows in the cabin, very often not more than one. Greased paper took the place of glass. The window was closed at night with a heavy shutter of wood. The door, swinging on wooden hinges, was thick and strong. It was fastened with a wooden latch, which was operated by a latchstring that hung outside during the day. At night, or when visitors were unwelcome, the door was made secure against intrusion simply by pulling in the latchstring.

The logs in the cabin did not fit smoothly together, and therefore the cracks between them were filled or "chinked" with moss and clay. In the fall, earth was piled up against the foundation logs of the house to keep the wind from blowing underneath.

There were no cellars under the log cabins. Some of them had no floor other than the ground itself, packed hard by the feet of the settler and his family. Some of the better cabins had a floor of "puncheons" — logs hewed flat with the same broadax that had been used in chopping the logs for the house. Such a floor, rough as we would think it now, was little short of a luxury then; it was certainly a comfort.

Of course, furnaces and stoves were unknown. Light and heat came from a wide, open fireplace at one end of the cabin. Most of the smoke went

A CABIN HOME

up the large stick-and-clay chimney built on the outside of the house, though some stayed in the room below. Cooking was done over the open fire and upon the broad clay hearth in front of it. There was usually but one room, and this room

served as kitchen, living-room and bedroom, all in one. Here the men sat in hours of leisure, while their wives and daughters worked over spinning-wheel and loom. In the evening the room was lighted by blazing pine knots or strips of hickory bark fed judiciously to the flames. On cold nights the fireplace was piled high with logs, and the warmth and light therefrom made the rough house a pleasant home to the pioneers.

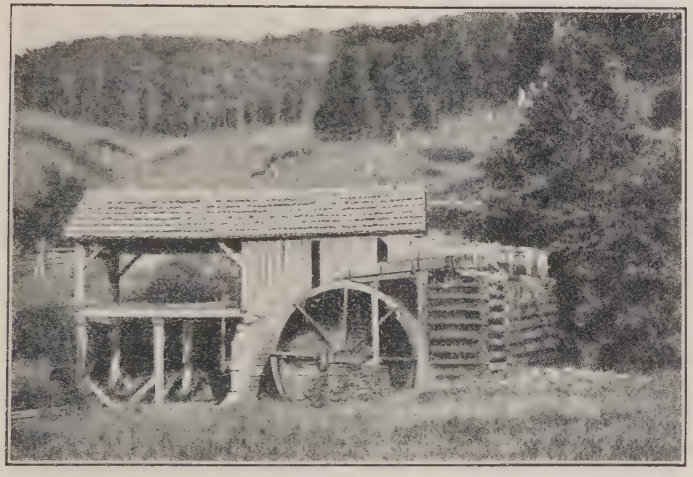
As for furniture, the settler had little that he did not make himself, for he could not bring many chairs and tables with him in the small wagon or crowded ship in which he had journeyed from his old home. Sometimes the chairs were rough, and must have been far from comfortable. The beds were only platforms or benches along one side of the cabin, with posts at the edges to hold them up. They were fastened to the wall, and unlike those of to-day, could not be moved from place to place. Hemlock boughs, dried grass, or corn husks helped to soften this rough couch, and balsam twigs often made the settler's pillow.

The log cabins, warm and comfortable as they were when well made, were really only temporary

quarters. The settlers, even when building them, were looking forward to better things. Within a few years, the cabins gave place to what were

BY THE OPEN FIREPLACE

called "hewed log houses" with clapboards nailed over the chinks, and with glass windows and other improvements. Finally, neat and roomy frame houses, covered with clapboards, took the place of the log-built dwellings. From these early days, American homes have steadily grown larger and better in every way.



The First Sawmills

THE early settlers were our first lumbermen. With ax and crosscut saw, they made their little clearings in the forest, getting timber for their houses and, at the same time, clearing land for the first crops. Their log cabins having been built and their corn growing, the pioneers had time to look about them.

All around them was timber, the finest in the world, and their first thought was how best to get rid of it. The wealth of the new country was mainly in its forests, wherein were found not only wood for building homes and keeping them

warm, but animals which furnished both food and clothing.

In the great American forests there were many fur-bearing animals, such as beavers, otters, minks, and foxes. The Indians trapped these wild creatures, trading the furs to the white men. They did not trade for money in those days, but for glass beads and other trinkets of which the Indians were very fond. Trading posts, where the whites could meet the red men, were built in various convenient places, usually by the side of some lake or river.

Around the trading posts small settlements gradually sprang up. Then lumber was needed for building houses and boats. The larger timbers were hewed and squared with broadaxes, but the boards and planks were made by "pit-sawing." The log, when squared, was placed over a pit in the ground, or raised several feet on a trestle, and a line was marked on it with chalk for the saw to follow. One man stood on top of the log, pulling the saw up; the other, in the pit below, pulled it downward. This was "pit-sawing" or "whipsawing," a very slow and laborious method, but the best known then.

A WHIPSAW

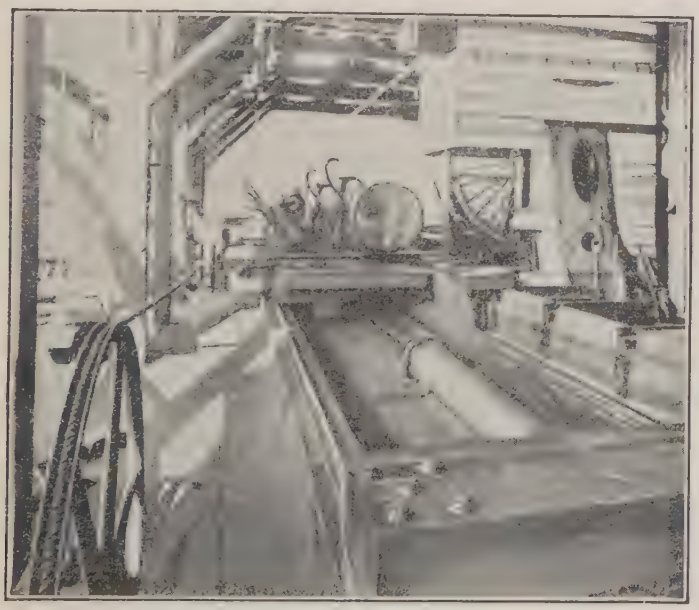
The first sawmill in our country was probably built at Jamestown, Virginia, soon after 1607. In 1623 the Dutch West India Company built three sawmills at New Amsterdam, now the city of New York. There a large wooden beam was used in place of the two hand-sawyers. It was really only another way of pitsawing. The wooden beam was fastened to a crank on the mill wheel. and the mill was run by wind or water-power.

Until after 1800, most sawmills were small and rudely built, with a single "up-and-down"

saw. Many of these mills were run by water power and made to do duty as both saw- and grist-mills. At them the farmer's logs were cut into boards and his corn was ground to meal. As

A PRIMITIVE SAWMILL

the pioneers gradually advanced westward, the sawmill usually followed the first houses in each little settlement, and sometimes the mills came



INTERIOR OF A SAWMILL WITH BAND SAW

first. Then water power was succeeded by steam power.

These primitive ways of sawing, which seem so slow to-day, lasted for many years. After a time, improvements were made. Circular saws

came into use, and at last the great band saws, such as are seen in all large mills to-day. A few hundred feet of lumber was as much as an old-style mill could cut in a day; now there are mills that saw a million feet.

Here again the American pioneer was at work; for his mills, driven by water power or by wind, were sawing the timber of this country more than a hundred years before there were sawmills in England.

INTERIOR OF A SAWMILL WITH CIRCULAR SAW

The Economic Value of Forests

From the earliest days forests have played an important part in the history of America. To the first settlers they gave shelter and warmth. Their homes, their schools, their meeting-houses were, for the most part, built of the rough timber. The blockhouses and stockades, to which the people fled in times of danger, were also made of logs; and the thick, strong walls of these log forts resisted well the attacks of Indians, thereby saving the lives of many a brave man and his wife and children.

The Indians were wise in the ways of the woods.

So the early hunters and trappers, learning from them, glided over the rivers and lakes in rude log dugouts or light birch-bark canoes. In those days, travel was quicker by water than through the tangled wildwood; it was safer, too, for there were enemies in the forest, and a boat left no trail.

The only roads then were really not roads at all, but merely "blazed trails," which ran from one house or village to another. The trail was marked by chipping pieces of bark from the trunks of trees which stood in its course. A blaze, standing out clear and white in the dark forest, could be seen for some distance. Later the trails became paths and then well-followed roads. Plank roads were sometimes made in the older settlements; and over boggy places and marshy lands, tree-trunks or logs were often laid down side by side to form a corduroy road. Bridges were needed to span deep streams, and for these much timber was used.

In the building of the first railroads, too, the forests proved of value. Formerly, all cars were made of wood, and the engines that drew them used wood for fuel. For the tracks heavy pieces

of sawed or hewn timbers were laid on the ties, and along these a narrow plate or strap of iron was fastened. This was called a "strap rail." To-day steel cars and steel rails are used instead of the wooden ones. Coal takes the place of wood in firing the massive engines. But these modern trains travel over rails that are still supported and held in place by wooden crossties, for which no satisfactory substitute has been discovered.

From the forests came the wood that built all of the houses in the first towns and cities. Even to-day houses are built in whole or in part of wood. Lumbering, wood-working, pulp-paper making, tanning, and countless other industries are still dependent upon the forest, which gives work to thousands of men and women.

The value and importance of forests, therefore, was, and still is, very great. Their products are worth many millions of dollars a year. But the forests, which once covered such a large part of our continent, have steadily grown smaller and smaller. When there was a superabundance of woodland little thought was given to its preservation. The forests stood in the path of civiliza-

A FOREST IN MONTANA

tion, and much of the timber had to be destroyed. A great deal was wantonly wasted.

To-day, we recognize the value of trees and strive hard to save and care for the forests which remain, in order that they may aid and prosper the people of the future.

The value of the forests in the development of the manhood of our country cannot be overestimated. Had the early settlers found a land prepared for the plow, houses and cities ready built and waiting to be occupied, the American people would never have acquired the hardiness and strength of character which have made America so great a nation.

"He who plants a tree, plants a hope," says an American poet.[1] And an English essayist[2] adds, "A man does not plant a tree for himself, he plants for posterity. And, sitting idly in the sun, I think at times of the unborn people who will, to some extent, be indebted to me. Remember me kindly, ye future men and women."

[1] Lucy Larcom. [2] Alexander Smith.

The Forest To-day

A LARGE portion of America is still wooded. In the East there are timberlands and small "woodlots" wherever one may go. In the West there is even more woodland, with finer forests, for the West is the home of great trees. Although only a little more than one quarter of our country is now covered with forests, the United States has still more woodland than any other country in the world, save Russia. After Russia and the United States, Canada is next in extent of wooded territory.

There are now in this country an Atlantic forest, a Pacific forest, and a Rocky Mountain forest. In the Middle West is a great belt of country where few trees grow. That a considerable part of the great mid-western plains was once wooded there can be but little doubt; but the fires of many seasons, some the result of accident, others to furnish better grazing lands for herds of bison, finally killed this growth. The heavy sods of grass, together with the dry

IN THE ROCKY MOUNTAINS

climate, have made other regions forestless, although along most water courses there is still a scattered growth of trees.

Trees are in many ways like people. There are some that cannot live in the cold Northern climate, others that cannot thrive in the South. Some need one kind of soil and plant foods, some another. Many trees must have a great deal of water, while others seem to do better where there is not much rainfall. There are trees that live in high places, the hills and mountains, and trees that seem to like the sheltered valleys best. Some need a great deal of sunlight, others but very little.

In both the East and the West you will find many kinds of trees growing near together — trees that need the same kind of soil and climate in order to live. In the Atlantic forests of the East are found balsam, cedar, hemlock, larch, spruce, and white pine. The elm and maple grow there, too, and beech and birch. Farther south are the oaks and hickories, basswood, chestnut, tulip, and black walnut. Along the Gulf of Mexico are many kinds of pines; and in Florida are mahogany and royal palms.

ROYAL PALMS IN FLORIDA

In the Rocky Mountains are fir, blue spruce, and yellow pine. In the Pacific Coast region grow western hemlock, Douglas fir, sugar pine, and the famous big trees of California. Some of these trees are several hundred feet tall, larger by far than any to be found in the East.

THE TREE AND HOW IT LIVES

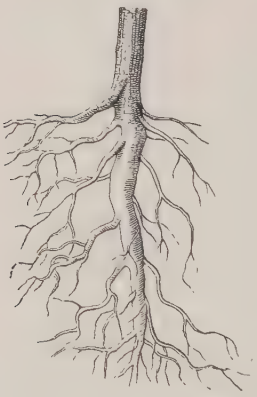
THIS TREE HAS LIVED THOUSANDS OF YEARS

The Tree

A TREE is a woody plant, with a single stem coming up from the ground. It is of longer life and greater size than any other kind of plant. Some plants live a few months; others, perhaps,

a few years; but the tree is a plant that lives on and on, year after year, often for a hundred years and more.

Every tree has three great parts — the *roots*, the *trunk*, and the *top* or *crown*. If it were not for its roots, the tree would soon fall. The roots hold the tree in place, helping it to grow tall and straight. They do more than that, for without them the tree would have little to eat or drink. Some of these roots are very long and strong, reaching far into the ground to support and hold up the tree. Deep down in the earth they go, to find water and foods for the tree above. On the ends of these large, strong roots are a great many little roots or rootlets. These are the younger parts of the roots, and so fine and small that sometimes they are called "root hairs." The root hairs drink a great deal of water. They also take up some mineral foods which the tree needs in growing.



ROOTS OF A TREE

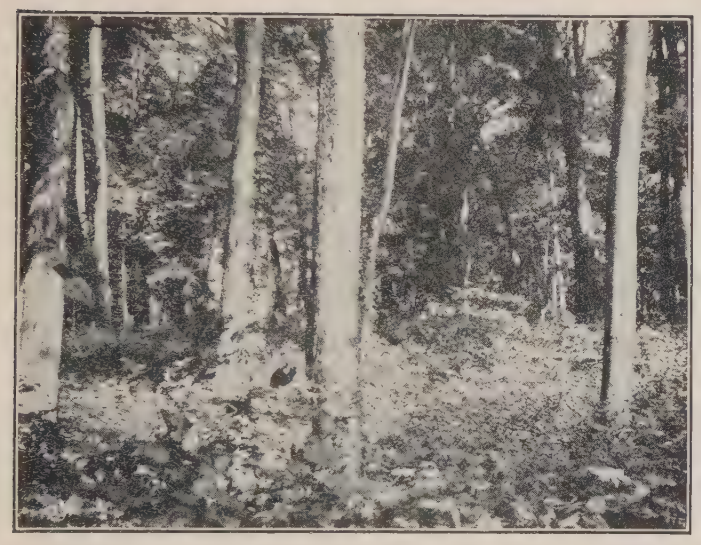
Think of these little roots as being so many small pumps; and think of the bigger roots, the trunk, and the branches as pipes leading up to the crown of the tree. The pumps force the water and raw plant foods up from the ground and into a layer of living wood which covers all parts of the tree and is called the "cambium." The foods, in their journey upward, are forced through this and the younger bark and wood. All contain many small openings or "pores" through which the food and water pass. On and on they go, sometimes for more than a hundred feet, until at last the crown is reached. There the food goes into the branches, buds, and leaves; and the leaves give off the unused water to the air.

Now all this time the leaves have been busy taking in carbonic acid gas from the air. This they do by breathing. A tree breathes day and night through its leaves and twigs, and through small holes in the bark of the trunk; but most of all through its leaves. The leaves combine the acid from the air with the water and minerals from the soil. The raw food which the roots have sent up is digested in the treetop.

Without light and heat trees could not live. For the leaves serve as the stomach of the tree, and they must have warmth and sunshine to help them digest the tree's food. After the food is digested in the leaves, it goes back to the tree itself, ready to be used. If the tree does not need this food in its new growth this year, it is stored up for next year's use all the way down the tree to its roots. Then, in the spring, it helps to form new shoots, new leaves, and tiny roots.

Look at a leaf. On it are many little raised lines which reach out to all parts of the leaf and back to the stem and twig. These are "veins," full of the tree's blood. It is white and looks very much like water; but the leaf is green, being colored with "chlorophyll." This green not only tints the leaves but helps them to digest their food.

A large portion of the tree's wood seems to be dead, and remains so from year to year. It has stopped growing. But the younger parts of the roots, the root hairs, and the buds and leaves above are all alive. They are the living parts of the tree.



How the Tree Grows

As the tree grows older the food which the roots take up and the leaves digest is helping it to grow in height and thickness. Trees grow very little in the winter. It is in the spring that their growth really begins, and in the summer that they grow best.

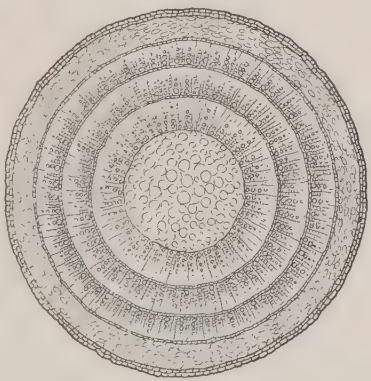
When the food comes back from the leaves to the body of the tree, it helps the newer, living wood, the cambium, to add a thin layer of wood to the trunk of the tree. This is like a new coat

which is slipped over the body of the tree each year. It covers the tree between the old wood of last year and the bark, which is pushed out farther and farther as the tree grows in thickness.

You can tell the age of almost any tree if you know how to ask. Look at the broad, flat stump of an old oak just cut down. On the trunk of the oak its growth for many years is plainly to be seen. You will see some little rings on the stump. These rings are narrow and very close to one another, and they show you where the coat of new wood was added to the tree each year. The inside of the ring, since it is grown earlier in the season, is called the "spring wood," the other grows over it later on, and is known as the "summer wood." Both are formed by the cambium, the living wood. It is only a narrow layer of a few cells; but this layer grows and, as it grows, divides. It makes the new wood each year — the annual ring. Inside, next to the cambium, is a layer of sapwood several years old. A little farther in is the heartwood, which is no longer alive. But the younger wood helps the cambium to carry the tree's food.

In the rings covering the stump the life his-

tory of the tree is shown. On one side may be seen a large, dark scar. Years ago — the stump itself tells just how many — a fire swept through the forest. It did not kill the old oak, a young tree then, but it left the burned place which you see now. Some of the rings are very close together. In those years there was little rain; the tree grew slowly and but very little. Some of the rings are far apart, showing how well the tree could grow with plenty of water. Perhaps there are other scars, of other fires, to be seen; perhaps also a scar where years ago the tree was struck by lightning.



SECTION OF A TREE SHOWING RINGS

Now as it grows in thickness, the tree at the same time is busy growing in height. In the first year of a tree's life its little twigs grow by a sort of stretching out, as if they were reaching upward for light and air. After the first year, these new shoots stop growing longer, and grow thicker.

And while they are becoming thicker by adding a new coat of wood, they are sending out from the little end-buds more new shoots to take their places. From the buds, every spring, come the

YOUNG PINES

young shoots which lengthen the twig and form the leaves and flowers.

If you look closely at the picture you will see on one of the young pines a small ax and a lunch-bag. At the top of this tree is a single short, straight branch. It is called the "terminal shoot,"

because it grows at the end of the tree's stem. While the other shoots at the side are helping the tree to grow one way, this one is helping it to grow tall. If this shoot, or its bud on the end, is frozen, or dried up or broken off, another near it takes its place, and the tree grows steadily taller.

While the age of a tree is shown by rings in the wood, there is an even easier way to tell the age of pines like these. It is not necessary to cut them down. A glance at their branches will tell you just how old they are. Each year new shoots have come out around the tree in a circle or "whorl" of branches. There are twenty of these whorls on the young tree at which we have just been looking, so we may know that it is just twenty years old. Perhaps a little more, for the side shoots of the first few years may have been lost as the tree grew upward. Now it is at least twenty feet tall.

Year by year the tree's crown is being built up, as buds grow into shoots with their leaves and flowers, the shoots into twigs, and the twigs into branches.

TREE SEEDS OF MANY KINDS

How Nature Plants the Tree

THERE are "mother" and "father" trees in the forest. The mother trees are called "seed-trees," and from them come the seeds that will some day grow into large trees too. The seeds grow with the buds and leaves in the top of the tree. Some trees have seeds on them every year, while on others there are seeds only once in every three or four years. In late summer and early fall the seeds ripen, and Nature makes ready for the planting.

The seeds from all the different forest trees are

of many sizes and shapes. When they are ready to leave the tree they all in some way reach the ground below, and in some way each tiny seed seeks to find itself a place to grow. How they leave the mother tree and reach their new home is an interesting story.

There are some seeds so light that when they are ripe it is very easy for the wind to pick them up and help them on their way, sometimes carrying them for many miles. Look at the seed of a sugar maple, and you will see that it is very light, though large. There is a little body or nut in the center, and on each side a small wing, as if it were really meant to fly. The ash and birch among the hardwoods, and the evergreen trees, spruce and pine, have small winged seeds that travel lightly on the wind. With the basswood, a part of the leaf falls with the seeds, and, like a kite, carries them far from the parent tree.

Toss up in the air a seed with wings. It circles around, falling slowly to the ground. If there is any wind the seed will finally come down far from where you threw it up. Now tear the wings from the same seed, and throw it up once more.

It falls rapidly this time, and the wind has little effect on it.

So wings have been given to these seeds. With them they are blown about far and wide through the forest, and where there are no trees. If all had fallen to the ground and remained under the old tree, there would not have been room for so many of them, and few of the seeds would ever have grown into trees.

Some seeds are large and heavy, far too heavy for the wind to carry. The wind could never carry the acorns, the hickory nuts, the chestnuts, or black walnuts very far. So Nature, always wise, has found another way.

The squirrels and little chipmunks live on nuts and acorns. In the fall they pick them up, hiding away many of them to feed on through the long winter. Sometimes these little animals carry off so many nuts that they forget where all of them are hidden; or perhaps they have more than they can eat. In the spring, therefore, many of the nuts which the squirrels have forgotten sprout and grow. It is said that three out of every five nut trees have been planted by the squirrels. Birds, too, are carriers of seeds;

flying over forest and plain they scatter the seeds of many trees and plants on which they feed.

Some fruits and seeds float easily on the water. Falling from the tree above, they ride off on some forest stream, until they are pushed ashore by the current to find a resting place.

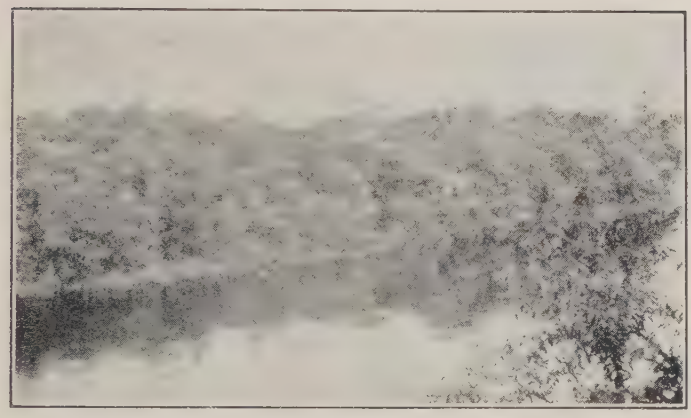
Seeds with little prickly coats stick to the furry backs of wild animals, and perhaps are carried like this a long distance before they fall to the ground and begin to grow.

CONE OF A SUGAR PINE

The evergreens keep their seeds in cones until they are ripe. Then the cones open to let out the tiny seeds inside. Most cones are only a few inches in length, but those of some Western trees are much larger. The sugar pine, a tree growing on the Pacific Coast, has cones which are from one to nearly two feet long. When the warmth of a hot California sun has caused these great cones to open, the hundreds of seeds inside drop out. They are all ready then to be planted and to grow; and from such small seeds as these, giant trees come up in time.

In some South American countries there are trees with seeds so heavy that when the tree lets them fall they go almost out of sight in the soft forest soil. Some trees have fruits that burst or explode, shooting out the seeds inside; others, like the coconut, float lightly on the water.

Young oaks and chestnuts often spring from the seeds of the older trees. But some of them come up in yet another way. When the old trees are cut down their stumps, still full of life, send out new shoots the following spring. These grow more rapidly than seedlings, yet seldom live as long as the trees which have sprung from seed.



WILLOWS

Willows nearly always grow along the bank of some stream or lake. The swift current and the waves sometimes snap off their branches. When these branches are afterwards washed ashore, they soon take root and grow.

So Nature plants her trees. The old trees die, but always Nature is sending up younger ones to fill their places in the forest.

The Tree and the Forest

MANY trees growing together make a forest. Trees in a forest are very much like pupils in a school. Some of the trees have grown very fast; they are very tall. Others have grown more slowly, and are short.

The trees have branches for arms, and trunks for bodies. They are breathing all the time, and like us, they must eat and drink to live. Some need a cold place in which to live. Others could not grow there at all. The palm of Florida

would not live long in Canada, and the spruces and firs of the North are rarely found in the South.

A FLORIDA FOREST

Sometimes two or three varieties of trees always seem to be near each other in the forest. Such trees are sure to be very much alike in many ways. They need the same plant foods,

the same light and heat. The balsam and the spruce, the chestnut and the oak, are trees that often grow together in the woods.

There are many kinds of forest in this great land of ours — from the pine woods of New England to the Florida forests, where grow the royal palms. In some forests there are only a few kinds of trees; in others there may be a hundred kinds.

Some of the trees we see in these forests have been growing for many years. They are very old, forest grandfathers, in fact. Under them, at their feet, many little trees are springing up. All of these younger trees are trying to reach the light, and in time they will take the places of the older ones.

The forest is a great plant society. Trees are its members, and they are of every age, and many kinds and sizes. They protect one another, and also give food and shelter to the wild birds and animals that seek a home in the quiet recesses.

SEEDLINGS

The Tree's Life — In Youth

Let us imagine a great many little tree seeds lying together on the ground. It is spring, and the seeds are just beginning to sprout. The frosts of winter did not kill them, for over them was a thick blanket of soft snow. A downward and upward growth is beginning. One little shoot, looking for light and air, pushes itself up from the ground. At the same time the first tiny root-

let is pushing its way deep down into Mother Earth in search of water and earthy foods.

Suddenly, in place of the seeds, we have a lot of little trees, growing larger day by day. Each tree lives its life in *five ages*. They have reached the first age, for now they are "seedlings," little trees not yet three feet tall. The seedlings may be only a year or two old, yet on them, young as they are, the three parts of every tree are very plainly shown. There are the first small branches with their pine needles, the body of the tree, and the roots with their fine root hairs.

At first the seedlings grow slowly, but in a few years they are more than three feet in height. Some of them have become taller than a man and are three or four inches thick. The seedlings are "saplings" now, and at the second age of the tree's life.

Beneath the saplings stands a young man. He is a forester, a man who takes care of trees, planting young ones, and cutting down the old when they have stopped growing. He aids Nature in one of her greatest works, the care of the forest.

The seedlings needed a great deal of shade.

Too hot sunlight would have dried them up and killed them. They had plenty of protection growing under the old trees, but now they are larger than they were then. They want more

SAPLINGS

light and heat, more food and more room. The seedlings had all the growing space they needed, but the leaves and branches of the saplings are crowding against one another. Their tops are fighting, and in the ground the roots are working against each other.

In the forest, as in life, only the strongest live. When the winds blow through the woods,

POLES

the trees beat against each other. They are so close together that many of the branches and smaller, weaker trees are broken down. Without branches and leaves a tree cannot live, for it is

then unable to breathe and get sufficient air. And so the larger, stronger saplings grow rapidly and become taller every year; but the growth of the over-topped trees becomes slower and slower. Finally they stop growing altogether, and before very long they die and are blown over by the wind.

Most of the trees that are left are now from four inches to a foot thick at the height of a man's chest. This is four and a half feet above the ground, and the height at which the forester measures trees. They have reached the third, or "pole," age.

The Tree's Life — In Old Age

The shade in the forest has now become great. The floor is covered with leaves and needles, and the tops of the trees are very close together. Beneath, it is almost dark, so dark that a great many of the low-growing branches are beginning to die.

In each tree, as in the entire forest, there is a constant struggle between the branches and twigs and the numerous tiny buds for food and light. The crown of the tree pushes upward to find these things, and soon cuts off the crowded branches below. The close-growing trees in the forest prune each other and themselves. The lower limbs, cut off from the light above, die as the tree grows taller, and are easily snapped off by the winds or broken as the trees whip against each other. When this occurs early in the tree's life, the small branch stubs that are left do little harm. They are soon grown over, and do not form the large, coarse knots found in trees with many limbs. Thus the forest-grown

tree makes good lumber, but that grown in the open is often fit only for firewood.

When the pole trees have reached the age of

STANDARDS

fifty or sixty years they are from one to two feet thick. Then they are called "standards." While the trees have been growing taller, they have also been increasing in size — in thickness as well as in height. As a full-grown man needs more food

than a small boy, so these standards need much more food than ever before. Their roots go deeper and deeper into the ground. They must have a great deal of water. No one knows just how a tree pumps water upward for a hundred feet and more. It is one of Nature's secret wonders.

It is hard for the big standards to get enough air and food. But still they keep on growing, though now more slowly than before. Soon they are more than two feet thick, and have reached the last age of their lives. They are the "veterans" of the stand. Only the very best trees can live to an old age, and those that are left at the last have lived through many a hard-fought battle in the woods.

The veteran trees, some of them seventy-five, some a hundred years old, bear the most seed. Every one of them must have a great deal of well-digested food. In the course of time these old trees become almost unable to get enough to keep them alive. The crowns are not large enough to take care of all the food the trees need. The trees are so tall that it is very hard to give the leaves and branches in the top sufficient water, and at last the veterans stop growing.

We saw the trees in these woods first as tiny seeds; then as seedlings and poles; now as large

A VETERAN

trees fit for lumber. They have lived a long, long time. Some of them finally die through the laws of Nature; some by the hand of man; and

there is much of interest in the way they live and die.

From the tiny seed to the wide-spreading tree is more than the span of the average human life. In the beginning the tree is but a small, weak seedling, barely strong enough to stand alone. The larger trees protect it from the hot rays of the summer sun and from the colder storms and winds of winter. Sheltered by the older trees, the seedlings too, in time, grow tall and straight, and become able to take their places in the forest where they grow. In turn they help to care for the younger trees below them, and finally, when they are no longer needed, they go too. There is much we may learn from the forest tree.

Live thy life
Young and old,
Like yon oak,
Bright in spring,
Living gold.

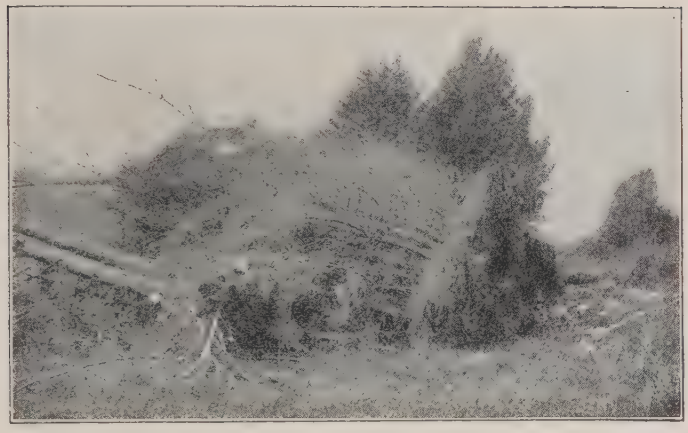
Summer-rich
Then; and then
Autumn-changed,
Soberer-hued,
Gold again.

All his leaves
Fall'n at length,
Look, he stands,
Trunk and bough,
Naked strength.

Tennyson.

THE TREE AND HOW IT DIES

A PREHISTORIC FOREST FROM WHICH COAL CAME



Why the Tree Dies

Trees, when allowed to grow, may live for a hundred or two hundred years; some, in the West, like that in the picture on page 40, have lived as many thousand. Some trees die in their prime, in middle age. Usually, however, it is the young, tender trees, or those that have grown old, that die. They do not die at once when attacked by enemies in the forest, but seem to die by inches. It may be many years before all life in them is gone.

Finally they decay, and perhaps the winds blow them down. For many years they lie where they have fallen; moss covers the old tree trunk;

squirrels and chipmunks nest in it, and at last it falls apart. Other and younger trees spring up to take its place, and the old veteran is not even missed in the forest where it once grew.

The forest has many foes. To-day few trees die of old age, for the trees are not only cut down and killed, but every year many thousands of them are destroyed by forest fires. Sometimes in great storms lightning strikes the trees, often setting them on fire at the same time. Wind and snow also break down the trees. Trees have their diseases, too. These diseases weaken them, and many of them die.

There are so many trees in the forest that there is not room for all, and some cannot get the food they need in order to live and grow. Insects prey upon and kill them; birds and squirrels eat many of their seeds. Mice, hedgehogs, and beavers gnaw off strips of their bark, "girdling" the trunks. The food supply from the roots is cut off, and the trees are soon killed. Just as trees are planted in many ways, so, too, in many ways they die.

Storms and Winds in the Forest

A GREAT many of the trees are blown over by the winds that sweep through the forest. Some are broken off in the middle of their trunks; others are torn up by the roots.

Here, in this picture, is a man standing on a tree. A queer-looking tree it is — crooked, and bent like a very old man. Once, long ago, this tree was straight. When it was still very young, a strong wind rushed through the forest one

night. It blew down a large, heavy tree which fell on top of the little one near-by, and bent it over. It was very small then, only a few feet high, and not nearly strong enough to push the older one from off it. So the little tree grew around it instead. Finally the old tree decayed where it had fallen. The picture shows plainly where the big tree fell on the smaller one.

In the course of forest storms, very tall trees and those growing on the high hills are most often struck by lightning. The same flash may strike several trees standing together, having a different effect on each of them. One may be scorched and burned, and the trunk split in two or cut down at the base; perhaps the bark is stripped from another, and pieces of wood torn off; or, again, the lightning may fill the tree's bark with hundreds of small holes, withering part of the crown, while on the other side the leaves escape unharmed. These strange pranks kill many a forest tree, and cause more than a few fires.

The Diseases of Trees

Most of the diseases of trees are caused by "fungi." Fungi belong to a large family; even bread mold is only one of these fungi in another form. Mushrooms, toadstools, and mildew are all related to the forest fungi.

Doctors say that most of the diseases of our bodies are spread by tiny germs in the air we breathe. Fungi have these minute germs, or spores, too; so small that you cannot see them. These spores are really very small seeds.

Long ago, perhaps, a woodpecker in search of

a worm bored a little hole in the tree we see here. Soon after, the spores of some fungus came flying along through the air and one of them fell into this same small hole in the tree's bark. There it began to grow, and from the seed once so small came this great white bunch. It is still growing, slowly but surely. The sound wood is beginning to decay, and in time this fine large tree will die.

Diseases usually attack trees where the bark has been cut or torn from the living wood inside. Here the small seeds find a place to grow, and soon cause the wood to rot where it was sound and healthy before. There are some fungi that live only on the bark and wood, where they soon produce cankers and swellings. Some of these swellings on the bark look so much like small shelves or seats that they are called "bracket fungi." But not all of the fungi living on the tree look like this. One of the mildews is like a fine white powder on the tree's bark. Then, there are some fungi that are always found on the tree's roots, while still others attack only the leaves, covering them with little spots.

There is one fungous disease which is killing

many chestnut trees. It is the chestnut blight or bark disease. The spores of this fungus find a growing-place in wounds or holes in the bark,

BRACKET FUNGI

soon spreading entirely around the trunk or limb. On smooth, young limbs they form dead, sunken patches of bark, patches thickly covered with orange or reddish-brown spots. This patch or canker grows rapidly, and may girdle the branch completely the first summer. If its limbs are attacked first, the tree may live for some time. But if the canker has formed on the trunk the tree soon dies.

A very odd kind of fungus is found in some northern forests. Leaves where these fungi have been at work will sometimes swell until they are very large, and look much like a bushy little broom — so much so that it is known as the "witch's broom."

Forest Insects

THERE are many little insects which live and feed on the leaves and twigs and wood of trees. Though small, the harm they do is very great, and numerous trees are killed each year by these "tree borers" and "wood wasps." They look like large flies, and usually the holes they make in the tree-trunk are large enough to be seen. The insects burrow in the wood and work their way into the tree, making small rooms in which to lay their eggs. In a short time the wood is filled with such holes, and often the tree dies.

Flies and moths lay their eggs on the tree's leaves. When the tiny eggs have hatched, the many little caterpillars feed and thrive on the soft, juicy leaves. The caterpillars of butterflies and moths eat the whole leaf, so that the tree sometimes loses all of its leaves early in the summer. Then there are beetles that eat only the tenderest parts of the leaf; the veins and outside of the leaf are left. "Leaf hoppers" drink the

sap, causing the leaves to curl up in little balls. Another insect, the "leaf roller," rolls up the leaf to cover its caterpillars. It sews the edges together, with fine silk threads, and there, hidden

NEST OF CATERPILLARS

from sight, the caterpillars live on the leaves. And there are some insects, such as "wire worms," that eat even the tree's roots.

Thus the insects injure our trees in many ways. Some trees lose their leaves each year, and,

finally, without them, die. Wood borers kill others, and when they are cut down the wood can only be burned, for it is full of thousands of small holes. The damage done to American forests by insects and tree diseases amounts to fully fifty million dollars every year.

Trees injured by fire are an easy prey for the insects of the forest. Sometimes the forest fires come first, sometimes the forest insects; but forest fires are always followed within a short time by hordes of insects which feed upon the dead or dying timber, and soon make its destruction complete.

In certain sections of the country only an occasional tree may be injured by these insects. Whole forests have been killed by them, and it is said that there are five hundred different insects which attack the oaks alone, and half as many others which prey upon the pines.

Forest Fires

THOUSANDS of trees are killed in this country every year by fires that burn through the forests. A forest fire lasting but a few hours may kill a thousand trees that needed a hundred years to grow.

There are several kinds of forest fires. Some of them burn for days and days out of sight on the ground. The forest soil is very rich, full of decayed leaves and the wood of old dead trees. So such fires frequently burn three or four feet deep into the earth. Fire fighters must dig trenches to stop them. Other fires burn the young trees and low bushes on the forest floor above. The worst fires of all are those that burn high up in the tree-tops.

Forest fires start in many ways. Suppose a hunter or fisherman to be camping out for the night. Of course, he has a campfire; it burns all night, and all goes well. Early in the morning the hunter rises. He piles more wood on his fire,

which has burned down during the night, cooks his breakfast, eats it, and sets out. He is in a great hurry, and does not bother to see that his fire is out before he leaves. It would take only

A FIRE WARDEN

a few minutes of his time, but hunting and fishing are best early in the day, and so he goes off hastily. Soon after sunrise the wind comes up. The campfire is still burning as the hunter left it. The wind strikes the fire and picks up some of the burning coals; they scatter to right and left, until there are a dozen fires in place of one.

Some time during the day another hunter, or probably a fire warden, sees the smoke and gives the alarm. Men come into the woods with pails and shovels. They fill the pails with water from a nearby brook, and throw it on the spreading fires as quickly as they can. When there is no water the fire fighters use their shovels, scattering loose earth over the blaze. They may have to fight the fire all through that day and night, perhaps for many days; and before that fire is finally out it may be necessary to start another — a "back-fire." Then, where the two meet, both go out. When the fire is finally extinguished, only a bare, dreary stretch of land, with not a single living thing in sight, is left.

Instead of the cool, green woods, there are now only dead trees and blackened stumps. Deer, rabbits, and foxes all run together from a fire like

this. The wild animals of the forest flee for their lives, forgetting each other and thinking only of escape. Sometimes the fire catches up with them and, like the trees, they too are killed. It takes but a few minutes to start such a fire as that; but it requires a hundred years to bring back the trees.

In summer, fires are frequently started along the railroads by sparks from the engines. People out for a walk in the woods throw down lighted cigars and cigarettes, or drop lighted matches. So in many ways the fires are started. The trees are almost as necessary to our welfare as food. We could not do without them. Always, therefore, we should be very careful when in the woods and forests.

Many people have been killed in these forest fires, for there are times when such fires will go as rapidly as ten miles an hour with the wind, and no one can run far at such a pace. Once, years ago, there was a great forest fire in the state of Michigan. This fire at first was a small one, and burning in sight of a town. It was only a brush fire, so no one put it out. But a high wind came up, the fire scattered and grew larger. Pieces of

"ONLY DEAD TREES AND BLACKENED STUMPS"

burning bark and leaves, whirled upward by the flames, were caught by the wind and carried all about. New fires started where they fell, and soon the forests around the town were all ablaze. The wooden houses, with their shingled roofs, offered fresh tinder for the flames. People fled for their lives. Some were taken out of danger by railroad trains, but not all were so fortunate. Those who were left could not get far on foot. Five hundred men, women, and children were killed or injured by that one forest fire. Two thousand people were left without homes.

To obtain the coöperation of the public in preventing forest fires the United States forest service has prepared several "DON'TS" which should be strictly observed by every person who has occasion to go into a forest, large or small, for any purpose. Here are a few of these rules: —

Don't throw your match away until you are sure it is out.

Don't build a campfire any larger than is absolutely necessary.

Don't build a fire against a tree, a log, or a stump, or anywhere but on bare soil.

Don't leave a fire until you are sure it is out; if necessary smother it with earth or water.

Don't burn brush or refuse in or near the woods if there is any chance that the fire may spread beyond your control, or that the wind may carry sparks where they would start a new fire.

Don't be any more careless with fire in the woods than you are with fire in your own home.

Don't be idle when you discover a fire in the woods; if you can't put it out yourself, get help. Where a forest guard, ranger, or state fire warden can be reached, call him up on the nearest telephone you can find.

Don't forget that human thoughtlessness and negligence are the causes of more than half of the forest fires in this country, and that the smallest spark may start a conflagration that will result in loss of life and destruction of timber and young growth valuable not only for lumber, but for their influence in helping to prevent flood, erosion, and drought.

Floods and the Forest

Floods, in their way, are equally as destructive as forest fires. Fields and crops may be flooded, buildings and homes broken up and carried away, and even lives lost as the result of a flood. Though forests may not seem to prevent floods, nor lack of woodland to cause them, it is often here that the real reason lies.

Have you ever been in the woods when it was raining? At first you do not feel the rain, for the

leaves overhead catch most of the rain drops. After a while, though, the water begins to trickle through, and soak out of sight into the ground. It is absorbed by the leaves and moss in the thick,

A MOUNTAIN STREAM

soft forest floor. Some of this water the trees drink, but most of it goes deep down into the earth. There it collects, and forms an underground pool or watercourse. This may flow along, much as a stream on the surface does, for several days or weeks before it finally comes out of some hillside or ravine as a spring of pure, cold water.

In the mountain springs and streams many of our great rivers have their sources. When these highlands are covered with forest growth, the flow of water is even and steady throughout the year. Every spring and fall, when there are heavy rains, the flow is lower, and in times of little rainfall it is higher, than in regions where there are no trees. The surface soil is held in place, and the water is clear and cold the year round. The snows of winter melt slowly, and the spring rains fall very softly here. The water soaks into the forest floor, and Nature stores it up to feed her lakes and rivers.

But when the woods are burned or cut away, the soil becomes hard and bare, and when rain falls, it does not soak in at all. On the hillsides there are no trees to protect the earth and bind

FOREST, MOUNTAIN, AND STREAM

the soil, and therefore the rain runs off as fast as it falls. It is gone so soon that it does little good to the hard, stony ground over which it runs. Most of the rich topsoil is washed away

NO TREES TO PROTECT THE EARTH

with it, and the hills are soon filled with deep gullies, the valleys with loose stones and sand. Water that would have fed woodland springs and streams for weeks and months is wasted in a few hours.

Floods are frequent in countries where the forest cover has been removed, and it is often necessary to replant at great expense mountain lands once covered with forest by the hand of Nature. The forest is undoubtedly a powerful regulator of streams and stream-flow.

HOW TO KNOW THE TREES

THE TREE THAT GIVES TURPENTINE

Some Things the Trees Give

Look around you in school. You are sitting on a wooden seat. The seat rests on a wooden floor, and perhaps the floor is part of a schoolhouse built of wood. The doors between the rooms are wooden, too, and underneath the plaster walls are lath and heavy studding, all of wood.

The book in your hand and the pad of paper on your desk were once parts of a tree in the forest. Your pencil and your penholder are

both made of wood. When you write with them, you use a wooden desk, dipping your pen in ink that was made from wood. The very shoes you have on were tanned with the bark of some forest tree. When the rain is falling, and the walks and streets are wet, remember that the rubbers you use to keep your feet warm and dry are products of the forest, too.

At home, the staircases and finishing, the chairs, the tables, and sometimes the bedsteads are made of wood; the younger children sleep in wooden cradles, and play with wooden toys; even paper for the magazines and newspapers on the oak reading-table came from the forest. Music, whether from piano, violin, or phonograph, comes from an instrument made wholly or in part of wood. The use of wood gives sweetness and a mellow tone, and nothing else can take its place.

Some trees give us sugar, others give us delicious nuts and fruits, still others give us tar and turpentine, and in South America are trees which furnish all the India rubber that we use.

Trees keep our homes cool in summer. In winter many of these houses are warmed with wood

fires, and the fires are lighted with wooden matches. In many homes wood fires cook what we eat every day. Even the coal comes from old, decayed forests which existed ages and ages ago. The woods help to give us the water we drink, storing it up, and giving it back to us pure and fresh. In countless ways the forests are of benefit and use.

Woodman, spare that tree!
Touch not a single bough!
In youth it sheltered me,
And I'll protect it now.
'Twas my forefather's hand
That placed it near his cot;
There, woodman, let it stand,
Thy ax shall harm it not.

. . . . . .

My heart-strings round thee cling,
Close as thy bark, old friend!
Here shall the wild bird sing,
And still thy branches bend.
Old tree! the storm still brave!
And, woodman, leave the spot;
While I've a hand to save,
Thy ax shall harm it not.

George P. Morris.

A NEBRASKA SCHOOLHOUSE

Arbor Day

EVERY year, in a great many of the states, a day in spring is set apart for planting useful trees. This is Arbor Day, and it was first observed by an American school in 1872, in the state of Nebraska. Here is a Nebraska schoolhouse. Nebraska was, for a long time, an almost

treeless state. But see what the pupils of one school alone have done. The yard about their school did not always look like this. It was once hot and dry in warm weather, and in the winter the wind blew so cold that the pupils could not play outdoors.

But now, on each Arbor Day, a tree is planted. How the trees have changed the appearance of things! The grounds about the schoolhouse are beautiful to look at, and afford a splendid place to play, cooler in summer weather and warmer

ANOTHER NEBRASKA SCHOOLHOUSE

in winter. The school itself is more pleasant the year round and a better place in which to work.

But look now at the picture of that other Nebraska schoolhouse. There is not a single tree as far as you can see, and the children that go to this school have never had an Arbor Day. Who would have believed that a few trees could make so much difference?

Beginning in a small way in a state without forests, Arbor Day is now observed in nearly every state. American, English, French, and even Japanese schools now have their Arbor Days. In this country the governor of each state names a day in spring when the weather is good for tree-planting. On that day the pupils in many schools go out into the school yard with the teacher. Some one digs a hole, and in this hole a very small tree is planted, often a young maple, a birch, or a beech. All through the school year the pupils water and care for the tree planted on that day. They watch its growth from year to year with interest, as the young branches shoot upward and the trunk grows in thickness.

The Beauty of Trees

Who would care to live in a house like this? There are no green trees to make the house and the yard cool in summer, none on the bare hills as far as you can see. In some parts of the world, even in the Western part of our own country, there are hundreds of square miles of desert and waste land far worse than this in the picture. As far as the eye can reach there is nothing but piles of drifting sand; nothing to shield the few travelers from the hot glare of the sun at mid-day; nothing to protect them from the great

windstorms that sweep across the plains. The few springs of water are many miles apart.

On great deserts there are occasional green places where the traveler may rest and quench his thirst. These places are called "oases." The passers-by, tired from a hard day's travel, eagerly watch for the little clump of trees on the sky-line where they may obtain rest and refreshment. In such places the few trees are loved and appreciated.

We, with so many trees, should be thankful for them. With the changing of the seasons there is always something new to interest and delight us in the trees around us. In spring they put on their new coats which are bright green in color until the summer's heat gives them a darker hue. With the frosts of autumn they change again, and the wooded hillsides are beautiful with their many-colored leaves. At last the leaves fall, and then we can better see how the trees themselves look. Their forms are plainly to be seen, and each looks different from its neighbor.

Winter over, the coming of the first small pussy willows warns us again that spring is on the way. Then it is that we like to get away from

the city, out in the woods and fields. Nature is never lovelier. The forest is sweet with the fresh aroma of spring, and a chorus of birds fills the air with song. Rabbits and squirrels go scampering

A FOREST ROAD

off at our approach. In the leaves and moss covering the forest floor we see the prints made by many tiny feet, the wild life of the forest. A

GATHERING NUTS

small, cold spring bubbles noisily forth from beneath some rock or tree; here and there clear streams of water ripple along over pebbly beds.

Through the long summer the forest is cool and inviting. When autumn comes the rich

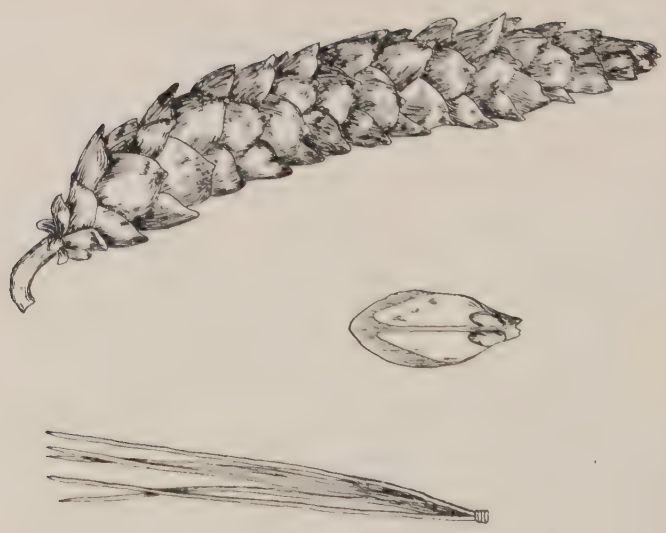
harvest of nuts on hickory and walnut trees makes the children glad. After a happy day spent in the woods, they come home with well-filled baskets in their hands. Going nutting is one of the truest joys of childhood in the country. Most of the nuts are ready to be eaten then, but some, like the chestnut, taste best when roasted by an open fire of blazing logs.

The tree's early leaf buds were bursting their brown:
"Shall I take them away?" said the frost, sweeping down.
"No, let them alone
Till the blossoms have grown,"
Prayed the tree, while it trembled from rootlet to crown.

The tree bore its blossoms and all the birds sung:
"Shall I take them away?" said the wind, as it swung.
"No, let them alone
Till the berries have grown,"
Said the tree, while its leaflets, quivering, hung.

The tree bore its fruit in the midsummer glow:
Said the girl, "May I gather thy sweet berries now?"
"Yes, all thou canst see:
Take them, all are for thee,"
Said the tree, while it bent down its laden boughs low.

Björnstjerne Björnson.



The White Pine

THE forest has many secrets worth finding out. One of them is how to know its trees — not only in their summer dress, but when the branches of some are bare, and you have only their forms, their bark and buds to tell you what they are.

The white pine, the spruce, the hemlock, the balsam, and the cedar are all evergreens or "conifers." The branches are clothed in leaves, and are green the year around. Their seeds are not like those of the other trees, for they grow in cones.

The white pine is one of the finest and most valuable trees in the forests of America. It is a giant of a tree, often a hundred and fifty feet high. The trunk is large and very straight, and the lowest branches are far above the ground.

The white pine's leaves or needles grow in clusters of five. They are of a blue-green color, straight and slender. Each needle is three-sided, with a small, blunt point at the end, and may be from a single inch to more than a foot long.

The tree's fruit is a cone, which ripens in the summer of the second season, and falls from the tree during the winter or spring. It is green, from four to eight inches long, and covered with loose scales. The pine has very small winged seeds, which the winds carry far from the mother tree when the cone finally opens to let them out.

On the young trees the bark is smooth and green, turning to a dark gray as the tree grows older; that on the trunks of large trees is broken up by long, deep furrows.

The pine's wood is light and soft. Much of it is used as lumber for building our homes, for the woodwork inside, and in making furniture

WHITE PINES

and desks, pianos, and organs. It is even used for the framework of airships.

Years ago this tree was very common in the northeastern part of our country. Great stumps more than six feet thick are still to be seen; here and there a few of the old, original trees are still standing. Tall and straight, they tower far above the younger ones about them, reminding us of the days when trees of that size were not so rare. The settlers were quick to see the value of the white pine, and in each settlement these great trees were the first to go.

The Red Spruce

THE spruce grows best in the cold climate of Northern woods, where it lives in low, wet places along the banks of streams and lakes.

It is smaller than the pine, usually not more than seventy or eighty feet high. Its leaves are not as sweet-smelling as the pine needles. They are four-sided, dark green in color, and quite short, seldom more than a half-inch long. The leaves are scattered around the twig, each one growing by itself.

The cones are an inch or two long, and look very much like small, red bananas. They ripen late in the autumn, and soon afterward fall from the trees, letting the seeds inside escape. Like those of the pine, they are winged and very

RED SPRUCE

small. The twigs and the bark on the trunk are dark brown. The wood is white and very soft. It is filled with a resinous sap which oozes out through cracks in the bark, and hardens into gum.

The roots of the spruce furnished the only thread and rope that the Northern Indians knew before the coming of the white man. The Indian brave used this "wattap," as he called it, to lace the bark sides of his canoe and wigwam, and sometimes it was woven into dishes and baskets. The early settlers in some places found the spruce useful for the walls and flooring of their houses. Recently and for many years, almost all the paper used for newspapers has been made of wood pulp manufactured from spruce trees.

The Hemlock

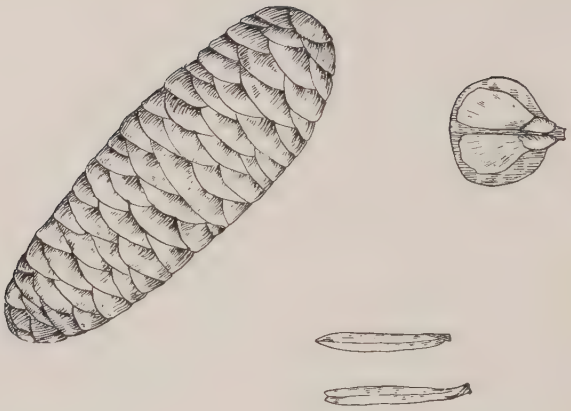
On well-drained slopes and on the edges of valleys and ravines the hemlock grows. It is a large tree, from two to four feet in diameter, and often seventy-five feet in height. The crown is somewhat open at the base, its slender branches tapering slowly upward. Like the spruce, it has single leaves. They are dark yellow-green above, a grayish-white beneath, flat, and rounded at the end. The stems are very slender, the whole leaf not over a half-inch long.

The red-brown cones are about three quarters of an inch long, and ripen in the autumn of the first year. During the following winter the seeds begin to leave the cone, and by late spring they

HEMLOCKS

have all gone. The seeds are not more than an eighth of an inch in length, but they have wings which are twice that long.

From light brown on the younger twigs and a darker shade on the branches, hemlock bark becomes reddish-brown in color on the tree-trunks. There it is thick, and deeply cut by narrow ridges. The brown wood, though light and soft, is coarse-grained and brittle. Its odor is unpleasant, and the wood is fit for little but rough building lumber. It is not lasting when exposed to the air. Yet the hemlock is a handsome tree in the forest; and though its wood is of little value as lumber, the bark, for many years, has furnished by far the greater part of the material used for tanning leather, both in the United States and Canada. And some of the wood is now being made into pulp for newspapers.



The Balsam Fir

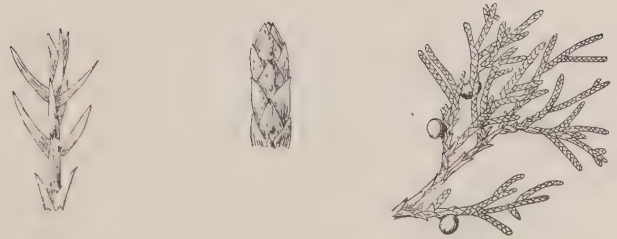
THE balsam fir is a tree we should all know and love, for the balsam makes a perfect "Christmas tree." It is not a large tree, seldom more than fifty feet tall, nor more than a foot or two thick. The leaves are small, not over an inch long. They grow singly, in two rows, on the side and top of the twig. In color they are a beautiful dark green on the upper side, pale green below and very flat. The same leaves remain on the tree for a long time, often eight or ten years, before falling off and making room for new ones.

Balsam cones are very large, three or four inches long and at least an inch thick. They are

dark purple and covered with fine, short hairs. Like those of the other cone-bearers, the balsam's seeds have little wings and are easily carried by the wind. The cone-scales, with the seeds, drop from the cone in the fall. Through the winter the bare stems left look like a great many little spikes standing erect on the branches.

The bark on the twigs and younger trunks is thin, smooth, and light brown; that on the old trees is thick, rough, and reddish-brown. The wood is light, soft, and pale brown in color. It does not make good lumber, though sometimes pulp paper is made of it. The leaves of this tree have an odor sweeter than any other of the sweet woods smells. At Christmas it fills the house with its fragrance. In the forest, balsam boughs give the woodsman an ideal bed and pillow.

BALSAM FIRS IN WINTER



The Red Cedar

THE home of the red cedar or juniper is in the swamps and low lands of the North, where it grows slowly and lives to an old age. It is usually a small tree, and one that looks very little like the other conifers.

On this one tree there are two kinds of leaves, and all cling to the tree for five or six years before they finally fall. One leaf is needlelike, a quarter or half inch long; the other is scalelike, sharp-pointed, and much shorter. Both are attached to the twig in clusters of two or three.

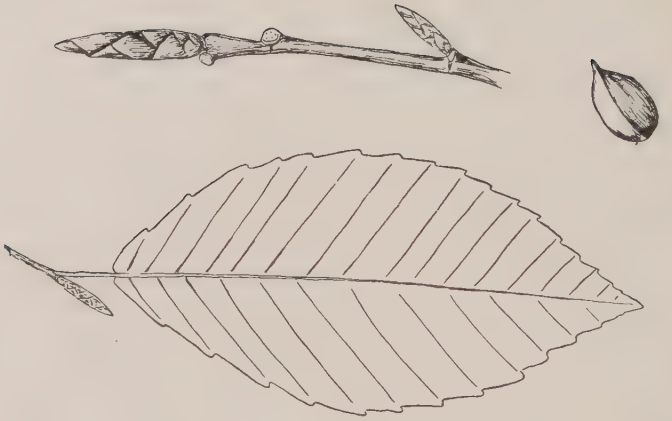
Cedar cones do not look like cones at all. They look more like berries. You can see no scales on them as on the pine and spruce cones. They are pale green when fully grown, dark blue or purple when ripe, and are very small and round, with quite a sweet taste. Sometimes these little cones

RED CEDARS

are called "juniper berries." Inside each berry are two or three tiny seeds.

The cedar has red bark and a light, soft wood. As the sweetness of the balsam comes from its leaves, the fragrance of the cedar comes from its wood. The younger wood on the outside of the tree's trunk is almost white. Farther in, it is dark red. In use cedar wood is very lasting. It is much used for lining closets and chests. The oil in the wood gives it a peculiar odor which protects the clothing placed in cedar chests from moths and other insects.

In early days the cedar post found wide use in rustic fence lines, where it stood for years without decay. Sometimes it is so used now, but nearly everywhere it has become scarce and very costly. Because of its fine, straight grain, the wood of the cedar has long been used as a covering for the lead of pencils. The tree itself is never very large, nor very handsome, yet it is one of the most useful in America.



The Beech

The trees with needlelike leaves, with small seeds in their cones, are mostly evergreens. Conifers, they are called. The others, with broad leaves and no cones, the seeds usually growing separately, are broadleaf or hardwood trees.

The wood of a cone-bearing tree is quite soft, often filled with pitch, while the broadleaves nearly always have a harder, finer wood. The pine and spruce are softwoods, but the beech, birch, hickory, oak, and many other trees belong to the hardwood family. Many of the hardwoods come up as shoots or sprouts from the stumps of

old trees that have been cut down, but the conifers rarely grow except from seed.

In all North America there are many kinds of pines, a great many oaks, and several different maples. But there is only one beech, which most of us know for its small, sweet nuts. It is a beautiful tree, rising in the forest to a height of seventy or eighty feet, often with stout, low-growing branches that make it an easy tree to climb.

The beech has a very old tree name, and many old, odd uses. The root of the word is found in an ancient language of the Hindus, a people of India; and the men of centuries ago, long before those times of which the Bible tells, wrote down their thoughts on strips of beech cut smooth and thin.

Beech leaves are of one piece, or "simple." The edges are sharp-pointed, with a small tooth at the end of each vein. The leaves, three or four inches long, are dark green on the surface, lighter underneath and very thin. The buds are a rich brown, and are long and pointed. Below the buds are the leaf scars — the tiny scars left on the twigs by last year's leaves.

BEECH TREES IN WINTER

Two or three of the sweet, three-cornered beech nuts come in a prickly husk which splits open at the top. With the first frosts of fall they ripen, and while the burs remain on the tree, the nuts fall to the ground below. Squirrels, mice, blue-jays, and even deer are very fond of them.

The beech has smooth, silvery bark. Its wood is light red, strong and tough. It has so little taste or smell that boxes and barrels for holding butter, sugar, and other foodstuffs are made of its wood.

In the first days of our own land there was little use for beech, for it was tough and hard to split. The trees were seldom cut except to clear the land for crops. Later, when the wood became better known, and the uses for wood grew, it was sometimes made into axles and shafts for water-wheels, where its strength made it lasting and valuable. It also, as charcoal, soon found its way into some of the earliest blacksmith shops. The shoes which many Dutch children wear are nothing but pieces of beechwood hollowed out and shaped to fit the foot. Thousands of these shoes are made in this country every year.

The Chestnut

THE chestnut is a noble tree, often growing a hundred feet high, with a straight trunk and a broad, spreading crown. The leaves are pointed and narrow, six or seven inches long and two or three inches wide. Like those of the beech, they have sharp little teeth which point toward the top of the leaf. The buds are brown and shaped something like an oval.

The chestnut, as it falls from the tree, must be handled with care, for sharp spines cover the burs, which hold two or three of the nuts. They are carefully done up in a small silk wrapper; packed in a case looking almost like leather; and buried in soft, downy pulp. Last of all, the nuts

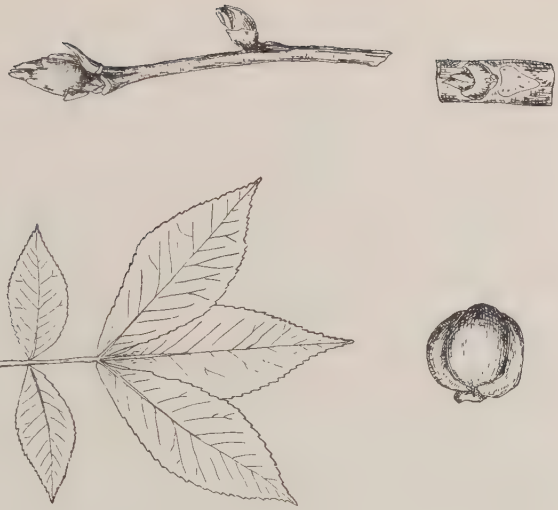
are tightly sealed up in a waterproof safe, and over all is a prickly coat looking much like that of a hedgehog.

The tree itself has dark brown, furrowed bark, and a soft brown wood. It is used for railroad ties, for fence posts, and for making cheap furniture, and lasts for many years, even when exposed to the rain and sun. An extract for tanning leather is made from the bark and wood.

"And when the winds of autumn, with a shout,
Tossed its great arms about,
The shining chestnuts, bursting from the sheath,
Dropped to the ground beneath."

A few years ago, a fungous disease known as the "chestnut blight," which we have already described on page 77, began to attack the chestnut trees in the vicinity of New York. It spread into the New England states and also to the west and south, causing the destruction of entire forests as well as of individual trees. The loss thus occasioned to owners of timber has been great, amounting to millions of dollars. No means of checking the disease has yet been discovered.

A CHESTNUT TREE



The Shagbark Hickory

The hickory, like the beech and chestnut, is best known for its nuts. But though, like the beech and chestnut, it is a nut-bearing tree, it is in many ways very different from them.

The hickory is a tall and slender tree, frequently seventy or eighty feet high, with stout branches and an open crown. The leaves are often as much as a foot long. They are made up of five to seven smaller leaflets growing on one stem. The single leaves of the other trees were "simple." These are "compound." The leaflets

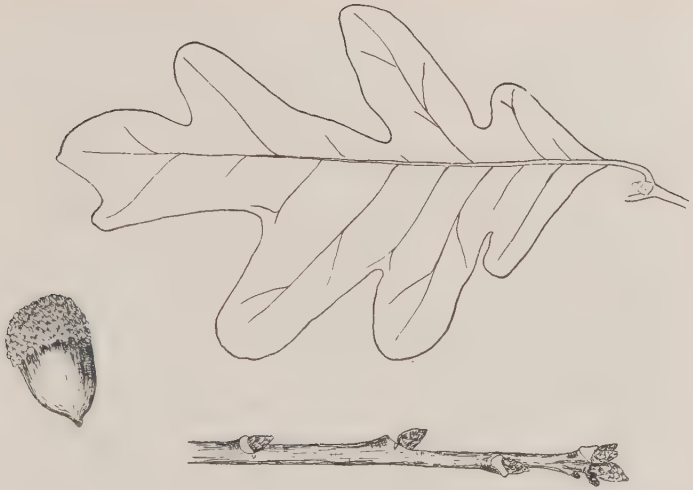
at the base are rather small, but those at the top are much larger, usually six or seven inches long and nearly half as broad. These dark green leaflets are finely toothed at the edges, and very fragrant when you crush them in your hand. The dark brown buds are over a half-inch long. They are covered with fine, soft hairs.

The hickory nut, like the beechnut and chestnut, comes in a husk. But the husk of the hickory nut is round, with a smooth coat, and holds just one nut. When it ripens in October, this thick husk splits open in four or more pieces, and falls from the nut. The nut too is round, with a thick, hard shell and large sweet meats inside.

There is a very shaggy appearance to the hickory tree. It is another tree which you may easily recognize by the bark. The bark is smooth and gray on the twigs and younger branches; on the old trees it is dark gray and thick, hanging from the trunk in long strips forced out by the growing wood inside. This wood is very strong and hard, and light brown in color. Hickory, when green, is heavier than water, and sinks in it like a stone. Hickory is used wherever a strong,

HICKORY TREES

tough wood is needed. The handle of the woodman's ax is nearly always made of hickory, and much of it finds its way into the wheels and bodies of carriages and wagons. With beech, birch, and maple, it is also much used as firewood.



The White Oak

One of the grandest and most valuable trees growing in any country is the white oak of our American forests. Its growth is slow; but it is also slow to die, and lives to a great age. The thick, strong trunk often towers upward for more than a hundred feet, bearing a broad crown of leaves.

The leaves are five to nine inches long, bright green on the surface, and a lighter shade of green underneath. In autumn the green becomes a beautiful red, turning later in the season to

WHITE OAKS

a rich brown. The edges are smooth, but the leaves are deeply notched or lobed. Some of the lobes are wide, with broad, shallow spaces between each one; others are narrower, and the space between deeper. The oak is not an evergreen, but many of its leaves cling to the tree through the winter. The buds of the oak are brown, and covered with small scales.

The fruit or seed is a light brown acorn, which rests in a little cup. This nut is nearly three quarters of an inch long, with a very sweet kernel inside. It is ripe in the fall, and the wild animals and some of the birds are very fond of the white oak acorn. Those small tree-planters, the squirrels, eat many of them, and the wild ducks and blue jays many more.

The bark on the young twigs and branches is light green. On the old tree-trunks it is thick and nearly white. The wood of the white oak is light brown, heavy, and very tough. It is lasting, and is used far and wide in a great many ways, from building ships to furnishing houses.

In the woods the old oaks, with moss-grown trunks and twisted limbs, stretch far above the other trees. They grow to a larger size and live

to a greater age than most of their neighbors. Some people call the white oak the King of the Forest.

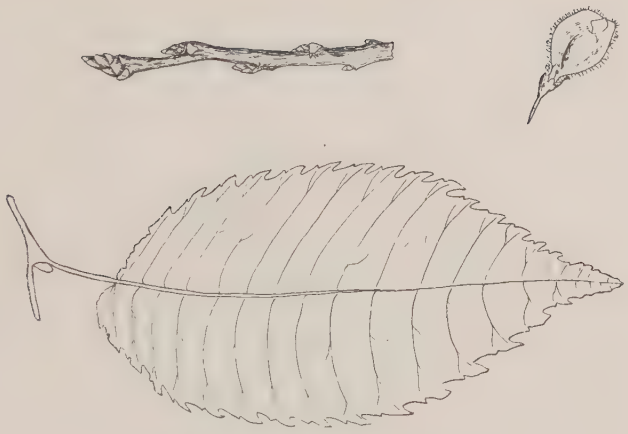
"The oak," says Washington Irving, "is an emblem of what a true nobleman should be; a refuge for the weak, a shelter for the oppressed, a defense for the defenseless; warding off from the peltings of the storm, or the scorching rays of arbitrary power."

A song to the oak, the brave old oak,
Who hath ruled in the greenwood long;
Here's health and renown to his broad green crown,
And his fifty arms so strong.

There's fear in his frown when the sun goes down,
And the fire in the west fades out;
And he showeth his might on a wild midnight,
When the storm through his branches shout.

Then here's to the oak, the brave old oak,
Who stands in his pride alone;
And still flourish he, a hale green tree,
When a hundred years are gone.

Henry F. Chorley.



The American Elm

The American elm, with its lofty spreading crown rising above a large, straight trunk, is one of the most beautiful shade trees that we have. Often its trunk is six feet in thickness, and sometimes it grows to be over a hundred feet high. Far above the ground the trunk divides into a few large branches, which turn up and out, giving to the elm a shape much like a vase.

Its dark green, oval leaves are from three to five inches long and about half as broad. They are double-toothed at the edge, with little teeth upon the larger ones. At the base one side is shorter than the other. Some leaves have curved

AN AMERICAN ELM

or broken veins, but those in the elm leaf are almost straight. The buds, like the leaves, are oval in shape, smooth, and light brown. They are not more than an eighth of an inch long, with large leaf scars beneath them.

The elm's seeds ripen early in May. They are winged and small, not over half an inch long. They grow in clusters on the tree. The seeds are smooth on both sides and flat. The wings of the seeds are light, and look something like paper. They are hairy along the edges.

The elm has light green twigs, which later turn reddish-brown, and finally gray. On the old trees the bark is gray and deeply-furrowed. The light brown wood is heavy, strong, and not easily split. Many baskets and barrels are made of it; the wheels on bicycles have elm rims; and for the hubs of wagon wheels, elm has no equal. Even those in the "One-Hoss Shay" of Oliver Wendell Holmes were made of elm.

The Canoe Birch

THE Indian of long ago found the canoe birch to be the most useful tree that grew. To this day its uses are many, different though they are from those of the early days. But it is not only a useful tree — it is a very handsome tree as well, with slender, tapering trunk, and a height of sixty to seventy feet.

The leaves, two or three inches long and nearly as broad, are dark green above and lighter below. They are very thick, with little sawlike teeth pointing sharply forward. The birch buds are

small, flat, and sharp-pointed. The fruit ripens in autumn, when it falls apart. The seeds themselves are winged, the nut narrower than the filmy wings on each side, which help the winds to carry them far and wide.

On the canoe birch the bark is of many colors — from dark red on the twigs to a beautiful creamy white on the trunk; nearer the ground it is almost black. The inner bark is orange-colored and easily stripped from the trunk. Thin sheets of it give to the woodsman a sheet fairer and more fragrant than the finest papers made by man.

The wood is light and hard, with a reddish tinge. The lasts used for making shoes are often of birch. Shoe pegs, too, are made of it, and many articles in daily use, from small spools to school desks and church pews.

Valuable as the wood is, it is the birch bark for which the tree is famous. It was the one tree the Indian could not well have done without. Broad sheets of this light, strong bark gave him his "wigwam." His fires were kindled with strips of the outer bark and kept burning with the wood of the same tree, a wood that, green or dry, will always burn.

CANOE BIRCH TREES

When the Indian's dried meat gave out during a long winter, the inner bark dried and powdered supplied him with flour that lasted until the next hunting season. Torches, too, were made of birch bark, and dishes, pots, and pans at a time when there were none of tin.

But best of all from the birch came the Indian canoe. Strips of the bark peeled from the tree in spring, with the running of the sap, gave to the Indian a boat both strong and light. The canoe carried him near and far on hunt and chase, in peace and on the war path, over the lonely waters of wooded lake or stream.

For a century and a half, the birch-bark canoe of the red man was the craft of hunter and trapper, missionary, and explorer. It carried them where no other boat could go, helping the work of discovery and settlement and civilization in the new country.

The Tulip Tree

THERE is one forest tree with a blossom so beautiful that from this blossom comes its name — the tulip tree or yellow poplar. The tree itself is handsome, often growing to a height of one hundred and fifty feet, with a clean, straight stem without a branch for many feet above the ground. It is the largest broadleaf tree in America. Tulip trees grow especially well in the mountains of the South, where some of them have been found two hundred feet high, with trunks ten feet in thickness.

The leaves are very different from those of the white oak, elm, and birch. They are four-lobed, often six inches long, with a stem of about the same length. The leaf is very broad, with two pointed lobes at the sides, and a blunt end as if it had been cut off there. On their surface the tulip's leaves are a very dark green, with a lighter shade underneath. These colors change in autumn until the whole leaf becomes a clear, brilliant yellow. The buds, with large leaf scars beneath, are dark red, flat, and covered with a whitish bloom or powder.

The blossoms appear on the tree in May or June, after the leaves themselves are well out. They are one and a half to two inches long, having six petals, which are greenish yellow, with a spot of orange. The fruit ripens in the fall — September or October — and is like a cone. This light brown cone is two or three inches long, narrow and pointed. It is made up of many long, winged seeds which overlap each other.

Young tulip twigs are smooth and red, later becoming brown, then gray. When you bruise them they have a peppery smell. On the young tree-trunks the bark is gray and very thin; on

A GROUP OF TULIP TREES

the older trees it is thick and brown, with deep furrows.

The wood of the tree is soft and yellow, and there are many markets for it. Poplar is largely used in making furniture, and the woodwork in railroad cars and automobiles is often made of it. Paper is another of its products.

The tree has sometimes been called the "canoe wood." This canoe wood and the canoe birch are seldom found together, for poplar grows better in the South, the other in the colder climate farther North. From earliest days, where the tulip grew, dugout canoes were made of it. A boat built of wood is heavier, of course, than one of bark, but it is also stronger, and both the Indians and the earlier settlers in the South used the dugout. In fact, history tells us that several times in the Indian wars, men of the South left their settlements to attack the Indians on the frontier. They went by water, a safer and a quicker way, and the boats in which they went were poplar dugouts.

The Sugar Maple

This is the tree called by some the "sugar tree," by others the hard or sugar maple. But it is known to nearly every one as the source of maple sirup and maple sugar.

There are several other varieties of maples, as the red maple, the Norway maple, the mountain maple; but none of these is so valuable or so widely known as the sugar maple.

The sugar maple is a Northern tree, and in some states the most important hardwood. It

reaches a height of seventy-five or a hundred feet, with a trunk two or three feet in diameter. The crown, in shape, is like a broad, round dome.

Maple leaves are four and five inches long and about as broad, with large lobe-like teeth. The leaves in spring are a beautiful light green, turning darker as summer comes. In autumn much of the beauty of woods and hills comes from the maple leaves, which by then have taken on many brilliant colors — orange, red, and yellow. The maple's buds are very small, and of a reddish-brown hue. They lie close to the twig.

The seeds, like those of the birch and tulip, are ripe in autumn. They grow in pairs, two tiny seeds at the base, and each with a thin, flat wing. These wings are much larger than the rest of the seed, about an inch long. With them the seeds ride lightly on the wind.

As the maple twigs become branches the bark covering them changes in color from light brown to gray, though on both it is very smooth. The bark over the old tree-trunks is broken up by furrows, and is of a darker gray.

This tree has a wood both strong and heavy. Many articles for the home are made of maple,

A GROVE OF SUGAR MAPLES

from rolling pins and wooden dishes to organs and pianos. It is the wood used in many bowling alleys and roller-skating rinks, and it makes a handsome hardwood floor.

The present uses of maple are rarer and more expensive than those of years ago, when maple was a wood of general utility. In the settlement of America the homemade rifle stock was frequently of curly maple, and a great backlog of this same wood was found in many a settler's fireplace. For rough sleigh runners it was often used, as well as in much of the old-style woodenware; the ashes were considered very good for soft-soap making; and in the cabins were often violins and homemade spinning wheels of this valuable hardwood.

Sometimes the grain of the maple has a beautiful "curly" look. This is known as "bird's-eye maple," and furniture made of it is highly prized. Bird's-eye maple is merely an accidental variety of sugar maple. While growing in the forest, some of the buds have been unable to push their way through the thick bark of the tree-trunk. They therefore remained beneath it year after year, while the various layers of new wood

have grown over them. When at last the tree is cut, the buds are still there, forming a portion of the wood and looking very much like a great many little birds' eyes.

In the chapter on maple sugar, we shall learn something more about this tree, and its great economic value to man.

WORK IN THE WOODS

LUMBERJACKS AT BREAKFAST

With the Woodsmen

Abraham Lincoln and some of our other early presidents were born in log cabins. Not many of these log cabins are in existence now, but something quite similar may be seen in the great lumber camps in Maine, New York, Michigan, Wisconsin, and Minnesota. These are occupied by men from the towns and cities who go to the woods to find employment through the fall and winter. Such men are called loggers or "lumberjacks." They have almost a language of their own, and there are many things about them which are strange to us.

Many loggers usually live together. They all sleep in what is known as a "bunk house." They have no large, clean beds, no sheets nor pillows. Instead, each man has a little "bunk," covered with thick spreads or heavy woolen blankets. This bunk, or sleeping box, is just long enough to hold him, and not much more than two feet wide. There are many of these little beds around the one large room of the bunk house, sometimes three rows of them, built one above another, between the rough floor and the bark roof. Down next the floor, or in a corner of the bunk, is the lumberjack's bag, or "turkey," a rough valise, or only a sack, which holds most of his belongings.

The weather is cold in the North Woods. But the cabins of the logging camp are always warm. Dry moss is packed between the chinks in the logs to keep out the cold winds. In the center of the room is a large, round stove, often red-hot, where huge chunks of wood are burned. The bunk house has but few windows, for too many of them would make the place cold. The two or three in the cabin are so small that a man could scarcely crawl through one of them.

Every evening after supper, fifty or sixty men sit around the fire on stools and boxes or upon the long "deacon seat" which is just in front of their bunks. Of course, they have no chairs in the woods. They tell stories, or sing woods songs, to amuse themselves before going to bed. Perhaps some are grinding their axes in the log blacksmith shop outside. They go to bed about eight o'clock, for they must rise very early.

At half-past four in the morning a bell is rung loudly. The cook is ringing it to wake the men up. It is very cold and dark, but it is almost breakfast time in the woods. Some of the men are already up and have left the bunk house. They are the teamsters, who have gone to the log stables to give breakfast to the horses before eating their own.

The Backwoods Dining Room

It does not take the lumberjacks long to dress, for when they go to bed they take off only their caps and shoes. Warmly dressed, they are not cold during the night when the fire in the cabin stove dies down. On rising, the woodsmen wash in their tin basins with ice-cold water from some nearby spring or river. The cold water soon gets them wide awake.

Once more the great bell outside is rung, and the men rush out of the bunk house. These men are always very hungry, and there is no waiting until everyone is seated at the table. Each thinks of himself, for in the woods the rule is "first come, first served."

It is just a step through the snow outside to the kitchen and dining room, both together in another log house called the "cook shanty." Here are long wooden tables. There are no tablecloths, and the lumberjacks have no napkins. There are no glasses for the water, but all

the men drink from a single tin dipper. The knives and forks, and all the plates and cups, are made of iron or tin. The men sit on wooden benches and boxes beside the tables.

STARTING OUT

Their breakfast usually consists of black tea, baked beans, apple sauce, hot biscuits, large griddlecakes, and pie. They eat rapidly, very seldom talking to each other during the meal. These rough men are very likely to quarrel among themselves, or waste too much time in eating;

therefore there is usually a rule that they must not talk while they are at the table. In the woods the cooking is always done by a man, for feeding so many hungry mouths is hard work. He generally has two boys or "cookees" to help him. They split the wood, build the fires, and wash the tin dishes after the men have eaten.

In about ten minutes breakfast is over. It is still very dark outside, but it is time to start for the woods. It is cold, and the lumberjacks all put on their heavy coats and caps and woolen mittens. The teamsters go for their horses; the rest for lanterns, saws, and axes, and all are off for a day in the woods.

Felling the Trees

It is at least a mile to the place where the men are going to work. The twinkling lights of their lanterns serve as a guide over the white road. The snow crunches under their feet, and frosty snappings resound through the great forest. Hundreds of tiny stars are fading from sight overhead, and a large, full moon grows paler and paler up among the treetops. In the east a warm, red glow spreading over the dark sky, shows that the sunrise is not far off.

All too soon for the pleasure of the men the end of the trip is reached, and the song of the ax and saw begins on every hand. In the picture on page 165, some of these men are seen just starting to cut down a tall pine. One of them has notched the tree on the farther side with an ax. This notch makes the tree fall in the right direction, and prevents the splitting of the trunk.

The notch being cut, the lumberjacks are ready to use the crosscut saw. It is nearly

eight feet in length and very sharp. There is a wooden handle on each end. In the woods two men usually work together, for in that way they are able to do more work. If one of the men is hurt in handling the sharp axes or heavy timber, the other can go for help.

What a clear, ringing noise the saw makes as it cuts its way slowly, but just as surely, into the tree-trunk. It seems to be singing a cheery song. After awhile, at the very tiptop, the pine begins to sway from side to side. "Timber!" the men cry, and the tree falls swiftly to the ground.

The men leap on it with their shining axes. They soon "lop" off all the tree's branches; the branches are not fit for lumber, and would only make the moving of the logs more difficult. This being done, they pick up their saw again, cutting the tree-trunk into two or three long pieces or logs. Then they move on to attack other trees.

FELLING A TREE

Hauling the Logs

THERE comes a man with a team of horses. What fine, large animals the horses are! Each one of them weighs more than a thousand pounds; but they have need of all their strength in moving logs which often weigh as much or more than they. The horses drag a long steel chain behind them. At the end of the chain are some iron hooks. The driver fastens the hooks in one end of a large log, shouts to his horses, and away they go. The log is heavy, yet the horses almost run with it.

Soon they arrive at the "skidway." Here the logs as they come in are piled upon "skids" — two longer logs or poles laid parallel to each other and at right angles to the road. The man with his horses continues bringing logs to be loaded on the skids.

At the skidway a road of ice begins. It is a familiar sight to see street sprinklers at work in summer along city streets. The woodsmen have been using a sprinkler here. It is not just the same

A GOOD LOAD

as a city sprinkler, but it looks very much like one of them on runners. The runners are bent up at each end, and the road sprinkler may be hauled in either direction by the horses without turning it around. The men fill the sprinkler with pails of water from some nearby lake or river. Then they drive back over the snow road through the woods. The water is turned on and soon freezes solid. It is so easy for the horses to draw large loads of logs over such hard, icy roads that in some places where the road goes down hill, straw is scattered to check the speed of the sleds.

At the skidway the logs are rolled upon great sleds drawn by horses. Thirty or forty logs often make a load, and from the skidway they go to the "yard" or "log landing" on the high bank of a river not far away. Here each log is deeply branded on one end by striking into it a heavy iron hammer which carries in raised letters the initials or private mark of the men who own the logs. The river is covered with ice from shore to shore, and the logs are left there in piles to wait for warmer weather.

The Log Drive

With the coming of spring the river ice melts and breaks up. The water begins to rise, and the melting ice and snow make an angry flood of the once quiet stream. It is time for the "drive."

A crew of hardy men, the "river drivers," now take the places of the lumberjacks. These men must drive the logs downstream for many miles to the mills below. The men tumble the logs into the water. In a very short time the river is full of them. Several logs catch against each other and stop. A driver jumps out from the shore. He runs across to them, jumping from one log to another. In his hand is a "peavey," a stout stick six feet long, with a steel hook fastened to one side, and a sharp metal spike on the end. He grips the logs with this, pries apart those that have caught, and soon has them floating freely again.

Many of these men do not know how to swim. If they were to slip from the logs they would prob-

A DRIVE

ably be drowned. But this seldom happens. They wear heavy boots with spiked soles, and are quick and active at riding the tumbling logs.

The logs are now coming to the rapids — "white water," the Indians called them, because of the white spray that is dashed up by the rocks. The logs fly along faster than ever. All at once one of them catches on a rock; others catch on that; soon they fill the stream. River men call this a "log jam." In the river, all is blocked from shore to shore. Behind come thousands of logs with the swift current of the stream. They leap and toss about as the angry river forces them on.

A good driver jumps out on the jam. "A white water man," the others call him, for he is braver and more experienced than they. In a moment he has found the "key" log, the one that is holding the others back. He loosens it with his peavey. The whole mass begins to grind away and move on downstream. The driver turns toward the shore, running for his life from log to log. If he should fall among them he would be crushed to death. But he reaches the shore in safety, and the logs float swiftly forward on their last journey. Some jams are not so easily

broken up. Great charges of dynamite must occasionally be used to loosen the piles of logs.

The river drivers get wet every day. Often they fall from slippery logs into the ice-cold

DRIVERS AT WORK

water. But they never catch cold. They ride the smallest logs with ease, and with only a pole skillfully guide the larger ones in the stream. They eat their lunch beside the river, and never stop work until long after dark at night. Theirs is a rough, hard life, and one of constant danger.

Western Woods

Many of the trees which grow in the far West are of great size. The logs being too large and heavy for horses to haul, donkey engines and steam engines are used instead. The donkey engine is small but strong. It is fitted up with a cable and drum. A cable is a strong rope made of steel, and a drum is a large roller on which the cable is wound. When the lumberjacks have fastened the cable to the logs, the engine is started, and the cable rolled around the drum. Even the largest logs are dragged through the woods easily and rapidly. When the donkey engine itself must be moved, the cable is fastened to a live, standing tree. As the engine winds the rope, it pulls itself nearer the first tree, then to another, and so on until it has gone far enough.

In the picture, the donkey engine has just pulled the logs in from where they once stood as trees. The small steam engine will take them next. A steam engine looks odd in the woods.

Its tracks are nothing more than wooden poles. The men use poles instead of iron rails because the former are so light that they can easily be moved from place to place. And such rails are very cheap in the forest.

IN WESTERN WOODS

The steam engine starts, the logs begin to move. There are many of them fastened together, forming a train of logs. For several miles they are dragged like this, until they come to a real railroad.

The railroad track is beside a steep hill, and the logs from the woods are easily rolled upon the flatcars. See how large those logs are — one log makes a carload. Heavy chains around the logs keep them from rolling off the cars; if they were to fall off, the logging train would probably be wrecked. The track is far too rough for much speed, and the train moves slowly around the sharp curves and over the high wooden trestles of the railroad that leads to the mill.

The Mill

At last the mill is reached. It stands near a large pond, beside which the train stops. The chains are unfastened and off go the logs, rolling down a short, steep hill into the water.

A long chain with sharp hooks runs up from the log pond to the mill. A man with a long pole keeps the logs moving toward the chain. The hooks catch each log, and hold it fast. Up

it goes. Soon, with many other logs, it reaches the top and stops. In a few minutes the "sawyer" is ready for it.

The log is rolled upon the log carriage. This carriage moves backward and forward very rapidly. Each time, the saw takes a thin slice from the log. The great bandsaws in the modern mill make short work of the largest log, and one saw cuts up hundreds of logs in a day.

The bandsaw cuts the log into rough planks and bark slabs. The slabs go to the "burner" with the waste wood; smaller saws trim the bark from the edges of the boards, others cut off their uneven ends, and the bright new boards are sent out to the "yard." This is a yard of another sort, where lumber of the same size and kind is stacked together in high piles so that the sun and wind can dry it. The piles stand close together, and narrow alleys run between the rows.

When a few months' exposure in the open air has dried them out, the piles are torn down. The lumber is loaded on two-wheeled trucks, and drawn by horses to the planing mill. In the planing mill are many smaller saws and planers. The saws cut and trim the boards to many lengths

and widths. The sharp knives in the planing machines smooth off the rough edges and surfaces. The lumber from the yard goes through one machine or another, and comes out as flooring, ceiling, moulding, or lath.

But a little while ago this lumber was living and growing in the forest; it was part of a tree. Then the tree was cut down and made into logs, the logs into boards and timbers. Now it is ready for use. From the mill the forest products go to the waiting cars outside. In the cars they are sent to every state in the Union. Some of them go to seaports, from which they are shipped to many countries abroad.

BY-PRODUCTS OF THE FOREST

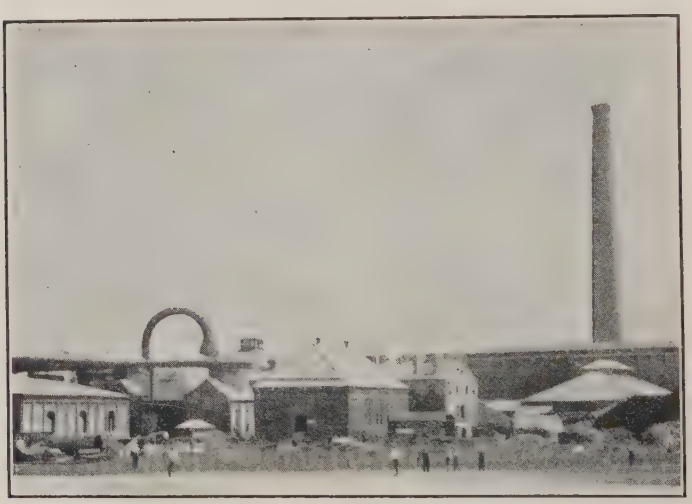
ONE LOG MAKES A CARLOAD

Paper Made from Wood

THE logs in some forests, instead of going through a sawmill and coming out as lumber, pass through another sort of mill where they are made into something quite different. "Paper made from wood" sounds almost impossible, yet every day, in great mills, logs are being converted into printing paper, wrapping paper, and cardboard.

Until 1854, paper was made almost altogether from the fibers of cotton, hemp, or flax. Then a new method was found, of making certain kinds of paper from wood. Wood used in making pulp or paper is called "pulp wood." There are thousands of pulp logs here — spruce, hemlock, balsam, pine, and perhaps other kinds as well.

Some have been brought by the railroads; others have been floated down to the paper mill

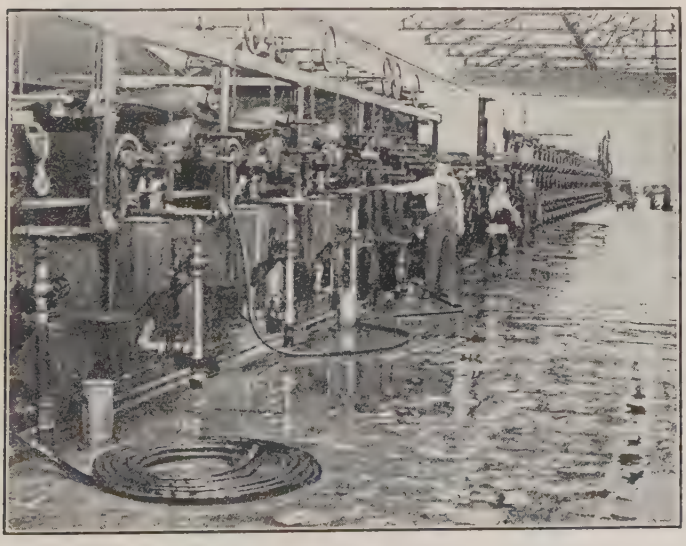


A PAPER MILL

from the woods above. The logs of most hardwoods, when fresh-cut and green, are so heavy that they will not float. But these pulp woods are light, floating easily on the water. Great rafts of them are carried here from the woods by the swift current of the river.

All of the logs in a drive are not owned by a single man or company, for many loggers use the same river for their spring drives. Such being

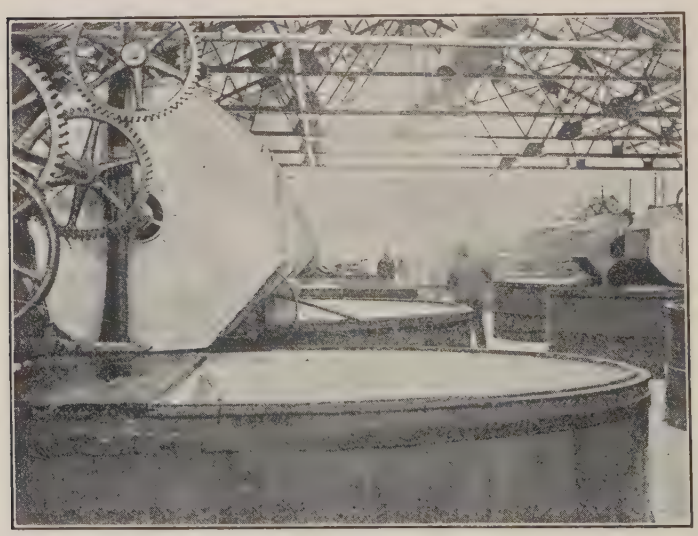
the case, these logs are branded on one end with the initials or other mark of the person who owns them. Afterwards, the men at the pond sort out the logs, bringing together all of the same mark. They are taken from the water and from the cars beside the river and placed in high piles. As soon as they are needed they are again loaded on small cars, and run into the paper mill.



IN THE MILL

In the mill small, sharp knives soon cut the bark from each log as it comes along. Others bore

out the knots, and the log is cut into small bolts a foot long and five or six inches thick. These are shot into a huge machine called a "hog." This hog is a powerful grinder, and the wood,



PULP VATS

after going through it, is in small chips, and ready to be "cooked."

When cooking or steaming has softened the chips, they are ready to be taken into the "beater room." There, in immense tanks, the wood is reduced to fibers, which are beaten or bruised

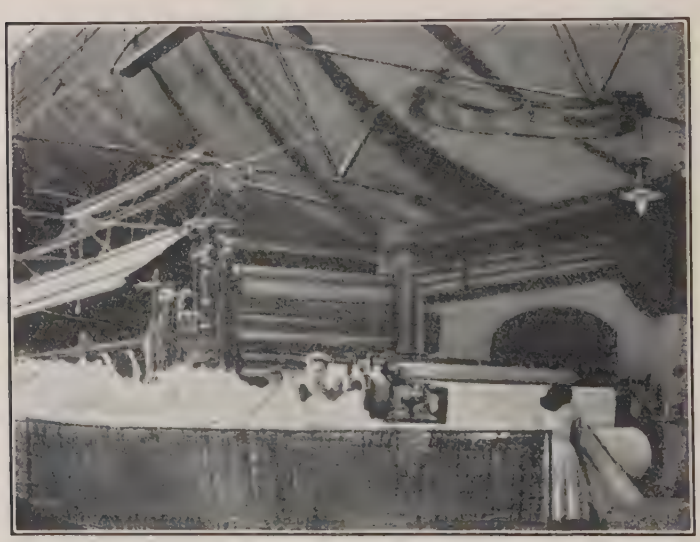
until they form a stiff pulp — the pulp from which paper is made.

The pulp from the beaters is then run into large chests. These chests supply a still larger vat, which is connected with the "machine room." Here enough of the pulp to make a sheet of the right thickness is dipped up on fine wire cloth. Of course it is still very wet from cooking, but as soon as the pulp is raised from the vat, the water begins to drain through the wire cloth. Along the edges is a removable frame which keeps the pulp from running off with the water.

As the pulp is run through the machines, the fibers become intertwined and matted together. It is gradually rolled into a thick, smooth sheet of pulp. Further pressure squeezes out any water left in the pulp, reducing the sheet of paper to the desired thickness. The sheets are then run over large heated drums and dried, after which they are ready for "sizing." At the end, sheets of the same size are wound up in great rolls.

Paper-making is a continuous business. The whole process is like a great endless chain, and the mills are kept running day and night, without a stop.

Various kinds of wood are made into as many different kinds of paper. Printing and packing papers and pasteboard are made from pine; poplar is made into fine white papers for books and



magazines; hemlock, spruce, and balsam supply most of the coarse paper on which the newspapers are printed. All the spruce trees that grow on five acres of forest land are required to make the paper for printing one day's issue of a large city newspaper.

The Charcoal Burners

THOUSANDS of cords of wood are made every year into charcoal, an important fuel that is used not only in many homes, but in large iron and steel plants as well. There are several ways of making charcoal, but where wood is plentiful and cheap the "open pit" is used.

A place in the heart of the forest is chosen by the charcoal burners for their pit. This is near the supply of wood to be used in it, and the cut wood is stacked up nearby. Large logs are not often used, for better charcoal is made from

the saplings and young sprouts. Sticks from four to six inches thick are best, but some of those used are even smaller.

READY FOR BURNING

When the wood is stacked and ready to be burned, the grass sods are taken up from the place where the pit is to be made. This is in the shape of a circle twenty or thirty feet across, and there the earth is packed down tight. The burners place a layer of brushwood over the earth, and in the center drive a long stake. The wood,

split into many small pieces three or four feet long, is stacked up about the central stake. More wood is piled up in the same manner until the ground is well covered. Then another layer of sticks is placed over the first. On top of this a third layer is built up, making the finished pile about twelve feet in height. Such piles frequently contain as much as fifty cords of wood.

This great stack of wood is then covered with dry earth to the depth of two or three inches. Over this earth the sods taken from the ground are laid. In the whole pile only two open places are left, one at the bottom, the other at the top. The lower hole is filled with chips and a fire is kindled. Smoke begins to pour from the top, and the whole heap is soon ablaze. Flames follow the smoke to the top of the pit. Then this hole is covered with a heavy piece of sod.

Sometimes, soon after the flames have been checked in this way, explosions follow. Parts of the dirt roof over the pile are blown off, but the men quickly cover them up again with dry earth. At last, when there is less smoke and no more explosions, the hole near the ground is also closed. After this, the pile needs but very little

attention. The fires that were started at the base slowly eat their way to the top until the whole pile is in a glow; then more earth is thrown over it. In five or six days a small hole is made in one side of the heap. If there are no flames to be seen, the wood has become charcoal; if flames come out, the pile must be left burning for a few days longer.

The burned pile is then taken down, and the charcoal carried from the "hearth" in long, flat baskets. It is hauled to the towns in wagons that

carry in one load two hundred and fifty bushels of charcoal. That seems a large load for two horses to draw, but the charcoal is far lighter than the wood from which it was made. It weighs only a quarter as much as it did before and takes up less than half the space.

The charcoal is easier to light than wood; it burns almost without smoke, and gives a better

A LOAD OF CHARCOAL

heat. Much of it is used for heating and cooking, and in days gone by, before coal was used as it is to-day, "charcoal iron" was made in nearly every furnace in the country.

PILING THE TANBARK

Leather Tanned with Bark

The wood of the chestnut tree and the bark of the chestnut, chestnut oak, black oak, white oak, and hemlock are used to make fine, hard leather from the soft, green hides of animals. The barks are more in use than the wood, and of these the white oak bark is used in making the best leather.

The tanbark trees are cut during the growing season of early summer. The work is always done at this time of the year, for then the bark peels easiest from the tree. It is stripped from the trunk in pieces four feet long with a "spud" or barking iron. The strips of bark are then stacked up against the fallen tree-trunk to dry. In a week, or perhaps sooner, the bark is cured, and ready to be drawn on sleds to the wagon roads running through the forest. It is afterwards hauled to the railroad whence it is shipped to different parts of the country.

On reaching the tannery, it is unloaded from

the cars and stacked in high piles, either in the open or in long sheds. It may stay there for months, for in most tanneries there is always a large supply on hand. In the yards of some

A TANNERY

tanneries there is sufficient bark for two or three years' use.

The hides, as they are brought into the tannery, look very little like the leather we know. They are soft and wet, and covered with hair and dirt. First of all the workmen clean and scrape them, throwing each hide as it is finished

into a great tank. This holds a liquid called milk of lime, in which the hides are left to soak for five or six days. From the tanks they go to another room to be shaved and scraped again. The scarf-skin or epidermis is removed from each hide, and with it the hair, leaving them clean and open for tanning.

In the meantime the bark, or the wood if that is used, is going through hogs and shredders which cut the large pieces into many small ones. The bark is cut, crushed, and twisted at the same time, breaking the walls of each tiny cell containing the tannin. It is now in small chips of the same size, and is thrown into vats full of water. There it is cooked for twenty-four hours, giving at the end of that time the tanning "liquor."

The hides, clean and ready to be tanned, are first hung from poles in pits of weak liquor for coloring. They are left in them for one or two weeks, and from these pits or "suspenders" go to the "handlers." The handlers are a dozen vats containing the tanning liquor, which ranges in strength from weak in the first few to stronger in the last.

In these vats the hides are laid flat, and handled every day. They are raised with a tanner's hook, piled beside the vats to drain, and then returned to the liquor. In handling, those which were on top when taken out are placed underneath when put back into the pits.

Every two or three days the hides are moved on to another of the twelve vats, each holding a stronger liquor, until the last is reached. When they leave that, the tanning is said to be finished.

The tanned hides are finally brushed, washed in very weak liquors, and placed in piles. There they are allowed to drip for several days to set the tan. By the time they are finally dressed, rubbed with oil, and dried, they do not have much resemblance to the green, soiled hides that went into the tannery only a few weeks before.

The Turpentine Orchard

When we think of an orchard, it is usually as an orchard of fruit trees; or, if in the forest, as a grove of sugar maples producing sap and sugar. The turpentine orchard is just as much of an orchard, though of a very different kind. The turpentine orchard is an orchard of Southern pines; and "turpentining" is an industry of much importance in South Carolina, Georgia, Florida, and some of the Gulf States farther west. The products of this orchard are what is known as "naval stores" — tar, pitch, rosin, and turpentine.

There are many methods of getting these valuable stores from the longleaf pines which are the trees most used. One of the best methods now in use in the turpentine orchard is the "cup and gutter" system. In common with other methods, this is carried on in January and February.

Two men, one right-handed, the other left-handed, go into the orchard. They carry with

PUTTING IN THE GUTTER

them two cornering axes, and together cut the bark on the tree. A few inches above the ground two flat surfaces are cut. The right-handed man cuts one, his partner the other, and the two men cut several hundred such surfaces in a day. Both these surfaces combined are a little more than a foot wide.

The next workman has a broadax for his tool. With it he makes two slanting cuts, one in each surface on the tree. One cut is a little lower than the other, and he places a gutter in each of them. The gutter is of sheet iron, two inches wide and nearly a foot in length. It is bent into the proper shape, two of them forming a spout, below which an earthenware cup is hung.

Beginning in March, the surfaces over each cup are chipped once a week with a sharp tool called a "hack" to keep up a good flow of resin. The hack is drawn across the two surfaces in a slanting direction, cutting one V-shaped groove above another in the wood of the tree. From time to time the cups are emptied of their "dip." In the early autumn the resin which has hardened on the tree is also scraped off and collected.

The next season the cup and gutters are moved

"HACKING"

to the upper end of last year's cut, and above it new surfaces are made. When the third or fourth season is reached, the gutters are removed from

A TURPENTINE STILL

the cupped trees. They are placed on new trees, or perhaps the old tree may be "bled" again on another side. This goes on until there is very little bark left on the lower part of the trunk.

From the tree, the crude product is taken to the

turpentine "still." Here the crude rosin is boiled with water, and the turpentine leaves it as a vapor. The vapor is caught in a coil of tubes, or "worm," where it is soon cooled by flowing water, and becomes a liquid. When these spirits of turpentine have been distilled, the melted rosin is run through a trough, then turned into barrels, where it quickly cools and hardens. An acre of orchard, in three years' bleeding, will yield as much as eight hundred pounds of rosin and twenty-five gallons of turpentine.

The pitch and tar produced by this industry found early use in the Southern colonies, and today these naval stores are still of much importance. The rosin is used in making soap, paper, oilcloth, printing inks, and medicines; the turpentine, for paints and varnishes.

IN THE SPRUCE WOODS

Spruce Gum

Spruce gum — that sticky, resin-like sap of the red spruce, which oozes from holes in the bark, then hardens to a gum — is found only in Northern forests. There are men who earn a

living by gathering this gum in the spruce woods of New York and New England. Their work is known as "gumming."

This gum is really the blood of the tree. It is seldom found on perfectly healthy trees, but often on those that have been attacked by insects or injured in other ways. When a limb has been broken from the tree, or the bark cut or filled with the burrows of insects, Nature in her own way repairs the damage quickly and well. The holes are filled with a thick, sticky fluid. At first this is pitchy and white in color. In the cold of the first winter it becomes darker, and hardens into many odd shapes.

Gum pickers spend much of their time in the spring months in scarring the trees. They climb a good-sized tree to far above the old branches. There, in the warm sunlight, a V-shaped scar is made on the south side of the trunk. The tree is plainly marked near the ground on leaving, and the picker is paid for his labor by the gum he finds a year or two later.

By that time it is dark red and very hard. Then it is really gum, and these men cut it from the trees with knives. Once in a great while one

of the men finds a pound or two on a single tree. It is sold in a near-by city, where two and three dollars a pound is paid for gum fresh from the woods.

This gum is shipped to a factory, where it is cleaned. The dirt and small pieces of bark are removed by machinery. It is then ready to be sold again, cleaner perhaps, but surely no better than when it was found on the bark of some old tree in the forest.

The History of Maple Sugar

As the first hunters, the first woodsmen, and the first builders in the American wilderness were Indians, so also were the first sugar makers. The Indian went about his sugar making in ways quite different from those we see and know today. With the coming of the first thaws in March, when the nights were still frosty and cold, but the days were warm and the snow beginning to melt slowly away from beneath the trees, the red man began to make ready for gathering the sap.

Then, as now, there were several kinds of maples in the forests — the hard or sugar maple, the red and silver maples, and one or two others

of less importance. All of these have sweet sap, but only that of the hard maple contains enough sugar to be of any practical value. So the trees which the Indians selected for his use were large, full-crowned sugar maples, trees that had been growing for many years and were full of sap.

On the sunny side of each tree he made a deep, slanting cut with his hatchet or tomahawk, and into the lower end of this he drove a curved piece of bark or a hollow reed. This carried the slowly running sap to a small dish of clay or birch bark placed on a stone at the foot of the tree. As the dishes became full, the sap was emptied into large troughs of elm bark, troughs which were sometimes large enough to hold fifty or a hundred gallons of this sweet stuff.

The sap was changed to sirup, then to sugar, in one of two ways. Sometimes it was made thicker and sweeter by being allowed to freeze in shallow bark vessels. The ice, as it formed on the surface, was thrown out, until enough water had been removed to give a thick sirup, or a sirup which would crystallize into sugar. This was a slow process and its employment depended entirely upon the condition of the weather. A

TAPPING A SUGAR TREE

better way to evaporate the sap was by boiling; but this also was slow and troublesome. For the Indian, having no iron pots, could boil the sugar water only by dropping hot stones into it.

From the days when maple sugar was a necessity, down to the time when its making became a business and its use a luxury, many changes and improvements have been made in the methods of its manufacture. This industry is one peculiarly American, and one that is to-day, as it has been in fact for many years, largely conducted by American farmers.

The early settlers also sometimes tapped their trees by means of deep ax cuts. The sap was stored in great tree-trunks hollowed into rough troughs. It was afterwards boiled down in large kettles in the open woods. Green timber, as well as wood already dead and down, supplied all the fuel that was needed. The old-fashioned iron kettle was hung over the fire from the end of a long, stout pole, which was weighted at the other end so that the kettle might be easily swung on or off the fire. Sometimes a number of kettles were hung from a single horizontal pole, or were set into a rude furnace constructed of clay and

AT THE SUGAR CAMP

stones. The sap was kept from boiling over by dashing cold water into the kettle, or by reducing the fire; and the pieces of bark or leaves and other impurities were skimmed off while the kettle was over the fire. The sirup thus produced, if removed from the fire at the proper time, formed a molasses, pleasant to the taste, but dark in color and not always of good quality.

With the increase of population, the demand for good sirup and sugar grew. This induced better methods, and the result was less waste and purer products. Sugar is seldom made now in the open woods, and in nearly every sugar bush is a small house or sugar shanty used in each spring's sugar making.

The old ax cut was replaced by an auger hole which did not injure the tree. At first this was a large opening, made to hold the wooden spout or "spile" then used. Gradually it was made smaller, until now the small metal spouts used fill holes only an inch deep and less than half an inch in diameter. Wooden pails took the place of bark dishes for catching the sap, and they in turn have now given way to vessels of galvanized iron. Years ago the men who went

from tree to tree gathering sap wore over their shoulders wooden yokes for carrying two pails of sap. Most farmers now have a wooden sledge in the camp. Barrels are placed on this, and the sledge is drawn from tree to tree by horses or oxen.

In some camps iron kettles are still used, and the sap is boiled down until thick enough for good sirup, or will crystallize and make sugar. The old way of finding this out was to dip into the boiling sirup a small twig bent into a loop, or to drop some of it on snow. If it formed a little film over the loop, or made taffy on the snow, it was taken from the fire and poured into molds where it soon turned into sugar. About four gallons of sap are needed to make a single pound of sugar. Usually the sap runs for three or four weeks, good trees giving as much as fifteen or twenty gallons of sap in that time.

In some of the larger groves the sap is now brought to the camp by pipe lines running in from the woods. In such groves the camp has become a roomy house for sugar making. It is kept with much cleanliness and care. In it the old iron kettle is no longer found. Instead, a long,

shallow pan over an iron fire box or arch is used. The pan is only a few inches deep, but made so that almost all of it is directly over the fire. The sap enters from a large storage tank at the upper end of this tank or "evaporator," and partitions in the pan cause it to flow slowly from side to side. The water in it rapidly evaporates. It is sirup when it reaches the other end, and is strained through flannel. Some of it may be reboiled in a sugaring-off arch until it crystallizes into sugar.

INTERIOR OF A MODERN MILL WHERE EVERY PART OF THE TREE IS UTILIZED

TREES IN AMERICAN HISTORY

THE BIG TREES OF CALIFORNIA

Penn's Treaty Tree

THERE are a few old trees in America which are famous. They stand year after year, living landmarks of some great event in the dim past. The American people treasure them with care, and it is right that they should do so.

The tree made famous by the treaty of William Penn with the red men was an elm. Penn was always honest in his dealings with the Indians, although other white men were not. So the red men loved Penn, calling him their

"Great White Brother." In the fall of 1682 he met many of them under this old tree. Here he smoked the "pipe of peace" with them; and here they made their treaty of friendship and brotherly love.

The Treaty Tree was growing as a sapling as early as 1540, when all the surrounding country was forest. During the American Revolution the tree still stood there as of old. In the winter of 1778 the English and Tories were in possession of Philadelphia, where the tree stood. They had captured the city from the American soldiers. It was very cold. Parties of British soldiers went out everywhere looking for wood, but this old Treaty Tree they would not touch. They spared the tree for the memories it held of earlier days.

But in 1810 there came a great storm. The tree had grown old and weak. It was blown down, and then it was learned, by counting its many rings, that Penn's tree had lived for more than two hundred and eighty years.

The Charter Oak

FIVE of the American colonies — Connecticut, Massachusetts, Rhode Island, New York, and Virginia — were settled under charter grants made directly to the colonists by the king of England. These charters set forth the rights and liberties of the colonists, and so were worth a great deal to them. Without their charters they might be treated unfairly by the English king across the seas.

In the year 1686 the king appointed Sir Edmund

Andros governor-general of all the New England colonies. The new governor-general soon demanded their charters. The people of Connecticut refused. A copy of their charter was made in June, 1687, but the original document was carefully guarded and kept under lock and key at Hartford.

Since he was unable otherwise to secure that which he had demanded, Andros finally decided to go in person to Hartford and take the charter in defiance of the people's wishes.

A session of the Colonial Assembly was being held at the time in the meeting-house. Andros, with a company of soldiers at his beck, appeared before them and commanded them to deliver the charter into his hands. For some time the representatives of the colony discussed the matter with him. The meeting was purposely prolonged until twilight, or as people then said "early candle light." Candles were then lighted, and the charter was brought out. It was placed on a table in the center of the room. There Andros saw it for the first and last time.

As the governor put out his hand to seize the precious document, all the candles in the meet-

ing-house were suddenly "snuffed out." Outside, many people were waiting. They began to shout loudly, and several entered the room where the meeting was being held. Among them was Captain Joseph Wadsworth, a brave and clever man. In the darkness and confusion he picked up the charter unseen, carried it away, and hid it in the hollow trunk of an old oak in the outskirts of the town.

In the meeting-house the candles were presently lighted again, and all became quiet. Governor Andros looked about him. There was no charter to be seen. He demanded that it be given up to him at once. But no one there could, or would, tell of its hiding-place. The angry governor was finally obliged to leave without it.

Long before this, the same oak had been the Peace Tree of the Suckiaug Indians. The acorn was their sacred totem, and under this tree they held their councils. At the foot of the tree their war hatchets were buried. Under its branches they smoked the pipe of peace.

This giant of the forest was fully twenty-five feet in circumference. At the time of the charter incident the hollow in its great trunk was large

enough to hold a child. From the summer of 1687 to the spring of 1689 it safely kept the charter of Connecticut. Eight years later the opening closed completely. The Charter Oak lived on from year to year, a sturdy relic of the past, until, on the night of August twenty-second, 1856, there came a great storm, during which the old tree was blown to the ground.

> One night, my children, from the North
> There came a furious blast.
> At break of day I ventured forth
> And near the cliff I pass'd.
> The storm had fall'n on the Oak,
> And struck him with a mighty stroke,
> And whirl'd, and whirl'd him far away.
>
> — Wordsworth.

The Boston Liberty Tree

In the year 1765 there was a great deal of unrest in the colonies. The Americans complained of being treated unfairly by the English. This had been the case for a long, long time.

The English thought it fair to make the Americans pay heavy taxes, as their ancestors had done before they left England. But the Americans were unwilling to pay taxes without receiving any benefits thereby or being given any voice in the government of the colonies. They protested that "taxation without representation is unjust. If we pay English taxes, we must have English rights." But these the king of England refused to grant to them.

Sometimes some of the Americans held meetings. There the patriots came to talk over what they might do to help themselves. At first they did not think of rebellion. They wanted only to be treated fairly and given their rights. But justice was refused by England.

In some places patriotic societies were organized. The members of one great and now famous society called themselves the "Sons of Liberty." They were young and brave men who lived in and near the city of Boston. They were fearless, and were willing to risk even their lives for liberty.

Finally came the Stamp Act of 1765. The Stamp Act was a law fixing a tax upon checks, receipts, and other commercial papers used by the colonists. The Americans regarded it as only another act of British injustice. That summer the Sons of Liberty met many times, not in some large building or hall, but under the spreading branches of an elm tree. They called their tree "Liberty Hall."

Not long after the Stamp Act was passed the stamps themselves arrived from England. Andrew Oliver, a Boston Tory, was named by King George III, to sell them to the people. But Oliver sold very few. Early on the morning of August fourteenth, two effigies were hung upon the Liberty Tree. Now an effigy is a likeness or make-believe of something or some one that is real, and these two effigies looked very much

like two men. One of them was made of wood and straw and old clothing. This represented Andrew Oliver, the stamp agent of the king. The other effigy was in the form of a large boot, with a devil's head and horns peeping from the top. This boot stood for Lord Bute, an English nobleman and a great favorite with King George. The colonists did not like their king and they did not care for Bute, his favorite, who was a weak and unjust man.

There, on the tree, these effigies hung all day. At night a great many colonists came out on the streets of the city. They formed a parade, and the effigies were cut down from the Liberty Tree. Some of the paraders carried torchlights, others the figures of Oliver and Lord Bute. And as they marched, the patriots shouted "Liberty forever! No taxation without our consent! And no stamps!"

Six months later the law was repealed in London. The American colonists had no more English stamps. But the old tree, their cradle of Liberty, did not have much longer to stand as a reminder of those stirring times. English troops held the city of Boston in the summer of 1775.

One of their first acts was to order the Liberty Tree cut down. Americans loved it, but it was hateful to the sight of the Englishmen.

The soldiers came with their axes. One of them was so pleased with what his fellows were about to do that he climbed to the very top of the tree. The men below set joyfully to work. Theirs was no easy task, for the tree was not a small one. They had chopped for some time, when suddenly the old tree shook. It swayed from side to side, then toppled and fell, with the British soldier in it.

The Washington Elm

Let us imagine ourselves in Cambridge, Massachusetts, on the third of July, 1775. It is nine o'clock in the morning, and the colonial troops are drawn up on the Cambridge Common.

The soldiers are all in line; they are waiting to receive their new commander-in-chief, General George Washington.

Soon Washington and all his officers appear. He walks with them from his headquarters to the great elm which now bears his name. They halt under its broad canopy of shade. Under the elm General Washington draws his sword, and takes command of all the Continental Army. It was a great day for America. Ever since, the tree under which this ceremony took place has been called the Washington Elm.

The tree was even then very old. It was older by half a century than the welcome of the Indian Chief Samoset to the white settlers, in 1621. To this day it stands there, admired by all who come from near and far to gaze upon it. Long life to the Washington Elm, the valued relic and reminder of those Revolutionary days so long ago!

Eighty years have passed, and more,
Since under the brave old tree
Our fathers gathered in arms, and swore
They would follow the sign their banners bore,
And fight till the land was free.

Holmes.

The Sequoias of California

No tale of the forest is complete without some account of the giant sequoias of California, which are among the largest and oldest trees in the world. The sequoias or big trees are relics of another age. Long, long ago these giants of the forest first began to grow. Centuries have passed, but still they live, vigorous and mighty as of old.

Many thousand years ago these aged trees

grew all over the northern half of the earth. Sequoias turned to stone have been found in Greenland. Greenland then was "green" indeed, a lovely spot on the earth's surface. Now it is a frozen waste; these stone trees alone remind us of what it was like ages ago.

To-day, in the twentieth century, but a few of these sequoias remain. Their home is on the western slopes of the Sierra Nevada Mountains, in California, where they grow more than a mile above the level of the sea.

These trees of wonderful age were first discovered less than a hundred years ago. In 1841 an old hunter and explorer named John Bidwell was making a trip on foot through the mountain woodlands of eastern California. One day he came upon a group of monster trees. There were at least a hundred of them standing together. He had never seen trees half so large as these, and when he returned to his home he told his friends wonderful tales of the forest giants he had seen.

Those trees are now owned by the government of the United States. They form what is known as the Calaveras Grove. During the last few years the government has bought several groves

of these big trees. But into some of the groves men had already gone and, with ax and saw, and even gunpowder, destroyed many of the noble old trees.

The sequoias are so lasting that, even when fallen, they lie on the ground for hundreds of years without a sign of decay. In California there is one tree with a tunnel cut through the center of its trunk. Stages drawn by six horses pass through the tree every day. In years past, settlers have made their homes in old sequoia trees; hollowed out, the huge stumps must have made very comfortable and fairly roomy houses in which to live.

One old fire-scarred stump has over four thousand rings on it — a ring for each year of its life. And this tree was not killed by fire, but cut down many years ago. Had it been left alone, it would probably be alive to-day. The trees now standing are between four and five thousand years old, and no one knows how much longer they will live if unharmed by man. Some of them are nearly four hundred feet high. Many of the big trees are between thirty and forty feet thick. In shape they look like pyra-

mids, broad at the base and sharp-pointed at the top. The bark is cinnamon-red, and at least a foot and a half thick. The sequoias are well protected by Nature. Insects, fungous diseases, and forest fires have no effect on these giants of the forest.

The sequoias are more ancient than the Sphinx or the Pyramids of Egypt; older by fifteen hundred years than the ruins of King Solomon's temple at Jerusalem; far older than Jerusalem itself. They were already two thousand years old ere Rome, the Eternal City, was begun; they were living, growing trees fully three thousand years before the beginning of the Christian era.

Oh! not upon that mossy trunk
Let the dire axe descend,
Nor wreck its canopy of shade,
So long the red man's friend, —
Nor to the cold, unpitying winds
Those bannered branches give, —
Smite down the forest, if ye will —
But let its monarch live!

Sigourney.

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